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ABSTRACT

Effects of a new type of problem-solving instructional material and a reinforcement method called Premack on problem-solving skills of elementary school children is investigated. The problems provided were an extension of the materials develcped for the Purdue Elementary Problem-Solving Inventory. The Premack Principle of behavior modification states that a preferred activity can be used as a reinforcer of related but less desirable activities. Phase 1 of the investigation served as validation for the training materials and reinforcement procedures. Phase 2 involved the formal training program. Three experimental groups were formed from classes selected to represent differences in social class and ethnic origins. One group received reinforcement for working on the materials; a second was given the materials as a regular part of the schoolwork with no reinforcement; and a third served as a control, and received no materials. Results demonstrated that the materials were effective in increasing problem-solving ability, but that children who used the materials without rewards outperformed children given rewards. Socioeconomic differences were observed, and it appeared that black children improved to a level equal to that of white children in the materials-plus-rewards group. (Author/SE)

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John C. Houtz

and

John F. Feldhusen

Purdue Research Foundation

West Lafayette, Indiana 47907

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ABSTRACT

Instruction in problem-solving is frequently neglected because teachers lack the appropriate materials or skill in controlling reinforcement to produce learning. The purpose of the present investigation was to evaluate the effects of a new type of problem-solving instructional material and the effects of a new reinforcement method called Premack on problem-solving skills of elementary school children.

The problems provided were an extension of the materials developed for the Purdue Elementary Problem-Solving Inventory (Feldhusen, Houtz, and Ringenbach, 1972). The materials were designed to provide practice in several of the abilities hypothesized to be vital components of general problem-solving behavior: sensing and identifying the problem, clarifying the goal, noticing details and redefining familiar objects in unfamiliar ways, guessing causes, asking questions, judging if more information is needed, foreseeing consequences, generating multiple hypotheses, selecting the best solution, and verifying hypotheses.

Premack is a method of reinforcement for use in programs of behavior modification. The Premack Principle of behavior modification (Premack, 1965) states that a preferred or desirable activity can be used as a reinforcer of related but less desirable activities. In operations in the classroom this means that such natural activities as free time during which students may play games, read, talk with friends, etc. can be used as reinforcers of such behaviors as working on assigned problems or practice activities.

The investigation was divided into two phases. Phase I served as a validation phase for the training materials and reinforcement procedures. Phase II involved the formal training program. Three experimental groups were formed using twelve classrooms. The classes were selected so as to represent differences in social class and ethnic origins of students. One group received reinforcement for working on the materials; a second group was given the materials as a regular part of the schoolwork with no reinforcement; and a third group served as a control, and received no materials. A pretest and posttest problem-solving measure and a retention and a transfer measure were administered to all groups.

Results of the investigation demonstrated that the materials were effective in increasing children's problem solving ability but that children who used the materials without rewards outperformed children given rewards. Socioeconomic differences were observed and it appeared that black children improved to a level equal to that of white children in the materials-plus-rewards group.

CHAPTER I
INTRODUCTION AND REVIEW OF LITERATURE

Purpose

The purpose of the present investigation was to develop and experimentally evaluate new materials and methods for problem-solving instruction. The instructional material consisted of worksheets depicting children and adults in real-life problem situations. The materials call for specific answers to questions about the pictures as well as the generation of creative, multiple hypotheses.

The new method evaluated is based on the Premack principle (Premack, 1965) which is a form of reward used in teaching situations. This type of reward is based on the principle that more frequent behaviors, such as play and freetime activities, can serve as reinforcers for less frequent behaviors, such as study behaviors. Thus, free-time away from school work will be made contingent upon study time, in which children will be given the problem materials. The second purpose of the project was to assess the effectiveness of this means of reinforcement with children from various ethnic and socioeconomic backgrounds.

To summarize, two components were combined in the present program: 1) relevant, real-life materials designed to focus on specific skills involved in general problem-solving behavior, and 2) a motivational component of free-time away from school work for working on the practice materials.

Review of Research on Behavior Modification

In recent years behavior modification techniques have been used to alleviate undesirable behaviors of pre-school and school-age children (Homme et. al., 1963; Madsen, et. al, 1968; Hall, et. al. 1968a; Sibley et. al., 1969; Schwarz, & Hawkins, 1970; Reynolds, & Risley, 1968; Wasik et. al., 1969; Hopkins, 1968). Essentially all of the approaches to behavior modification involve the specification of "target behaviors," or final behaviors to be achieved, the reinforcement of these behaviors or approximations to them, and the ignoring of undesirable behaviors.

In the studies cited above, teachers have successfully modified children's disruptive behaviors in the classroom. They have reinforced children for paying attention to work done at the blackboard, exhibiting good study behaviors, following and enforcing rules, asking questions,and helping other children. Many types of reinforcers have been used. Social approval and attention have proved effective, but candy, snacks, materials, such as paper, paints, or crayons, and tokens exchangeable for small prizes or special privileges have also been used. Each of these rewards was offered to the child contingent upon his exhibiting the desired behaviors.

Other researchers have employed behavior modification techniques with groups of children and intact classrooms of children of pre-school, elementary, and secondary grades (Bushnell, et.al., 1968; Schmidt, & Ulrich, 1969; Packard, 1970;

Glynne, 1970; Ward, & Baker, 1968; Barrish et. al., 1969; Hall et. al., 1968b; Thomas et. al, 1968; Osborne, 1969). These researchers found that positive reinforcement of desired behavior is effective with the class as a whole. They increased Ss' attention to tasks and lowered aggressive, out-of-seat, and talking-out behaviors. Access to play or special activities, extension of gym time or recess, social approval, between-period breaks, classroom games, and free time away from schoolwork all proved to be effective reinforcers.

One significant generalization to come from the behavior modification research has been termed the "Premack Principle," after David Premack (1959, 1963; 1965; Premack et. al, 1964; Schaeffer et. al, 1966; Homme, 1966). The principle asserts that "...for any pair of responses the more probable one will reinforce the less probable one (Premack, 1965, p. 132)." In other words,if a child engages in play activity at a much higher rate than another behavior, academic study behavior, for example, the former can serve as a reinforcer for the latter, thus increasing the frequency of study behavior.

Wasik (1970) made use of this principle with culturally deprived, black and white second-graders. Free-choice activity time was made available to the children contingent upon the occurrence of desirable classroom behaviors, such as enforcing the rules, sharing with and helping others, asking for information, following directions, or engaging in self-directed inquiry. Such behaviors increased considerably, while daydreaming, resisting, and aggressive behaviors decreased during the study.

The effectiveness of behavior modification techniques, and of the Premack Principle, in particular, have been widely demonstrated. Only a few studies, however, have been concerned with cognitive outcomes, and then only indirectly. Ward and Baker (1968) successfully modified aggressive behaviors of two groups of black first-graders, but found no differences on the Draw-A-Person test or several subscales of the Wechsler Intelligence Scale for Children. Lovitt and Esveldt (1970) were able to increase the number of arithmetic problems attempted and solved by a twelve-year-old boy, but the problems were simple addition problems, and no new learning was hypothesized to have occurred. Glynn (1970), however, found that ninth-graders learned significantly more of their experimental history and geography materials by being reinforced with tokens redeemable for prizes than did control Ss, who were not give tokens.

Research on Human Problem-Solving

The area of human problem-solving is not so well organized and well-defined as that of behavior modification. Reviews of the field (Duncan, 1959; Davis, 1966; Feldhusen, et al. 1971) have pointed out that there are a number of different theoretical models of the processes involved in problem-solving and that a great variety of tasks have been used, all purporting to measure problem-solving ability.

Children and adults have been required to solve mathematical and parlor-game puzzles (Ray, 1955), verbal analogies (Johnson, 1962), arithmetic problems, (Welch, & Edwards, 1965), insight problems (Luchins, 1942; Maier, 1945), syllogisms (Whinbey, 1968), anagrams (Mayzner, & Tresselt, 1958, 1959, 1962, 1966; Johnson, 1966), a vast array of concept-formation problems (Bruner, Goodnow, & Austin, 1956; Mattson, 1965), and switch-light problems (Tyler, 1958). Students have been placed in simulation situations: they have been city mayors, doctors (Rimoldi, 1955, 1960), army generals (Streufert et.al. 1965), and trouble-shooters for defective machinery (Glaser, et. al., 1954). Investigators have given students real-life problems requiring many hypotheses or possible solutions (Miles, 1968) and asked students to solve single-solution puzzles with match-sticks (Katona, 1940).

Theoretical models of problem-solving have also provided diverse views. S-R theorists have often relied upon the concept of the habit family hierarchy (Hull, 1934; Staats, & Staats, 1963), A number of different responses may be attached to any one particular stimulus or set of stimuli. A problem arises when the responses highest in the hierarchy and most likely to occur are inappropriate. Solutions come about by rearranging the hierarchy so that the correct, and infrequent, responses are emitted.

More recent revisions of this view have proposed that complex learning and problem-solving are the result of chains of many S-R associations (Kendler, & Kendler, 1962). By mediational processes, especially those of language, individuals are able to build up complex chains and shift from one parallel chain to another to solve problems.

Gagne (1959, 1964, 1966, & 1970) has developed a model of problem-solving which is built upon a structure of several subordinate kinds of learning or cognitive functioning. Problem-solving involves the generation of new rules which are applicable to large classes of situations. Each level of Gagne's hierarchy depends upon all of the lower levels, so problem-solving involves simple associations and chains of associations, discriminations, concept learning and rule learning.

Concept formation tasks have often been used in problem-solving research. Theoretical models of concept formation (Hovland, 1952; Restle, 1969) view the learner as an hypothesis generator and tester. Bruner, Goodnow, and Austin (1956) have described different ways in which the individual can attempt to isolate the relevant dimensions, or criteria, of concepts. Considerably different strategies are used, depending upon the age and experience of the subjects (Anderson, 1965; Stern, & Keislar, 1967), and some of these strategies are clearly not so logical as the hypothesis generation model implies.

Several researchers have attempted to simulate human problem-solving processes by means of computer programs (Newell, Shaw, &

Simon, 1958, 1970; Hunt, 1968). Such programs have been able to prove mathematical theorems, solve geometric analogies and word puzzles, play games of checkers and chess, perform paired associate learning tasks, form concepts, and exhibit other learning and associative behaviors in a similar fashion to human subjects.

The information-processing view of Newell, Shaw, and Simon attempts to break down complex behaviors into components by means-end analyses. At each of many stages in the problem-solving process, the individual is able to act on the input, or information, in many ways. To limit the many irrelevant operations available, however, heuristic search models are programmed into the computer. These models, such as the TOTE unit proposed by Miller, Galanter, and Pribram (1960), examine the consequences of each alternative step in the process and evaluate it with respect to the final goal.

Finally, a model which has perhaps generated the most comprehensive account of human cognitive abilities is that of Guilford's "Structure-of-Intellect (1959, 1967)." His SI model contains over 120 distinct abilities categorized in terms of operations (how the individual manipulates information), content (what kinds of information he deals with), and products (what output he obtains). Guilford's work has not only provided a way of describing cognitive skills within a larger framework, but it has also provided a method whereby specific skills or abilities may be isolated and identified (Merrifield et. al.

1962; Kettner et. al, 1959; Haynes, 1970). By factor analysis techniques, these researchers have found that general problem-solving ability consists of many different skills involving all of Guilford's operations: cognition, memory, convergent and divergent production, and evaluation.

Each of the theoretical models discussed above, however, with the exception of Guilford's SI model, attempt to explain only the psychological processes involved in problem-solving. While such models are productive, they are not applicable within the behavior modification framework. With behavior modification techniques, specific behaviors must be identified and reinforced. Thus, for the present investigation, it was necessary to focus on the tasks or skills which researchers have identified as part of the problem-solving process and which they have attempted to improve via training programs.

Quite a few training programs have been developed. Each has focussed on different abilities or skills. Ramirez (1970) provided practice in sensing the problem, defining the problem, generating alternative solutions, and foreseeing consequences. Means and Loree (1968) stressed retrieval of information and extraction of information from the problem statement. Suchman (1963) provided practice in analysis, comparison, isolation, and repetition of relevant details in different combinations. Parnes (1966) emphasized problem definition, utilization of available resources, generation of new and different ideas,

and evaluation of these ideas. Blank and Covington (1965) trained children to ask questions to gain more information about the problem. Torrance (1966) and Guilford (1967) have employed tests requiring subjects to generate multiple hypotheses, guess causes, ask questions, foresee consequences, and make transformations. The Purdue Creativity Training Program (Feldhusen, Treffinger, & Bahlke, 1970) emphasizes the generation of multiple hypotheses and foreseeing consequences of various events and actions.

The Purdue Elementary Problem-Solving Inventory (Feldhusen, Houtz, Ringenbach, 1972) was developed to assess twelve distinct skills or abilities hypothesized to underlie general problem-solving ability: sensing that a problem exists, defining or identifying the problem, clarifying the goal, noticing relevant details, redefining familiar objects in unfamiliar ways, guessing causes, asking questions, judging if more information is needed, foreseeing consequences, generating multiple hypotheses, selecting the best solution, and verifying hypotheses.

The Purdue Inventory was designed to identity and assess overt behaviors in children. For the present investigation, these same behaviors became the "target behaviors." Training materials were developed which provided practice in each of the skills listed above. Each child in the experiment was able to work on the materials individually and was rewarded for his efforts with free time away from school work. During the free time the children were able to talk to their friends, play games, and

engage in "high probability" behaviors. By making free time contingent upon working on the training materials, the free time activities, according to the Premack Principle, reinforced their work on the problems and thus increased the probability of problem-solving behaviors.

Objectives of the Present Investigation

The objectives of the present investigation were:

1. To determine the effectiveness of newly developed instructional material for teaching problem-solving.
2. To determine the effectiveness of the Premack method of reinforcement as a behavior modification technique along with the new instructional material in teaching problem solving.
3. To test effects of the instruction on several ethnic groups and on children at several socioeconomic levels.

CHAPTER II

METHOD

The following chapter will present the method and procedures used. The details of the pilot study and the trial runs will be discussed first, and then the subjects, instruments, materials, procedures, and design of the main study will be presented.

Pilot Study

During the summer of 1972, a pilot study was conducted to examine the workableness of the worksheet exercises and Premack reinforcement principles.

Subjects

Approximately 20 third-grade students from the Mayflower Mill and Battleground schools of the Tippecanoe School Corporation, Indiana, were invited to participate in a creative problem solving class at Purdue University from June 27 to August 3, 1972. These children had just completed third grade and were considered to be close, developmentally, to the children with whom the major part of the research program would be dealing. The children and their parents were told that the objectives of the program were to provide practice in solving realistic problems, but many fun activities, such as games and trips around the campus, would be included. Seventeen children accepted the invitation and attended.

Procedures

The class met twice a week for a two-hour period in the afternoon. The first half-hour was devoted to work on the worksheets (See Appendix E) and the second half-hour to fun activities. Each of the worksheets presented a cartoon drawing of children in a real-life problem situation. Questions were asked about the situations and children were to write as many ideas as they could to answer the questions. The situations called for the children to sense whether or not a problem did, in fact, exist, define the problem, generate questions to ask to help solve the problem, guess possible causes, foresee consequences of actions taken by the characters in the cartoons, generate alternative solutions, make use of objects in unfamiliar ways, and several other problem solving skills (Feldhusen, et. al. 1972).

The second half-hour was devoted to fun activities, such as arts and crafts, puzzles, games, and trips around the Purdue campus to the computer center, the library, the basketball arena and football stadium, and sandwich shop. Because of the fun nature of the program, the two-hour period was loosely structured into work and play times. Often, two work periods followed alternately by two play periods were included in the daily session.

Evaluation

No attempt was made to grade students. Through discussions with the children, individual attention, and observations,

worksheets were revised and certain types of fun exercises which were more appealing to the children were noted. The more active games were the most popular and those with a competitive element held children's attention longest. Many of the worksheets did not lend themselves to many solutions, and revisions were made. It was concluded that both the worksheet and Premack methodology could be adopted to group situations.

Trial Run

The objective of the trial run phase of the experiment was to evaluate the instruments designed for the present study and to tryout the worksheets in an actual classroom situation.

Subjects

The Ss for the trial run were from two fourth-grade classrooms in the Riverview School in Elkhart, Indiana. The Ss were all White and from an upper-middle-class background. These teachers, as did all teachers in the project, volunteered to participate. Since the children differed in terms of socioeconomic status from the "target" population of the present research, it was decided to use these classrooms in the trial run phase of the project.

Procedures

The Ss were given pre- and post-problem solving tests and materials to work on daily. Both classrooms were supplied

with games and books to make use of during the reward periods (See Appendix A). At first, the teachers in both classes were instructed to have the children work on the materials for two 15-20 minute periods each day and to provide a 15-20 minute reward period once a day. This procedure was unsuccessful in that too much time was taken away from regular classroom work and the reward periods were too short to allow the children to become involved with the games or complete them. After a period of two weeks, the number of work periods was reduced to one daily session of 15-20 minutes and the reward periods were increased to 30 to 45 minutes but reduced in frequency to twice a week.

The Ss were allowed to work on the same worksheet during more than one period. The teachers were encouraged to discuss each new worksheet but later observations indicated that such discussions were limited to listing new vocabulary words which occurred on the worksheets. The children were allowed, however, to look at each others' work, kept in large folders in a central location of each classroom.

Teacher's Manual

Each teacher in the trial run was given a teacher's manual describing the procedures to follow during the study. Because the study was a trial run, however, the manual underwent several revisions and only the final version, used in the main study, is presented in Appendix D. The manual was designed

to cover such areas as time and frequency of work and reward periods, description of the worksheets, criteria for stamp-grading, and suggestions for discussion of the worksheets.

Stamp Grades

The teachers were also given four different grading stamps: EXCELLENT, VERY GOOD, GOOD WORK, AND OK, BUT TRY HARDER. These were used to provide evaluative feedback on the S's work. The teachers in the trial run did not have trouble keeping up with the grading load. A set of criteria was provided for the teachers to assign the stamp grades: seven or more relevant responses was worth an "EXCELLENT," five or six was worth a "VERY GOOD", three or four was worth a "GOOD WORK," and one or two was worth an "OK, BUT TRY HARDER."

Duration of the Trial Run

The trial run lasted approximately six weeks, from October 19, 1972 to November 28, 1972. The total number of school days involved in training was twenty.

Pretest and Posttest of Problem Solving

Forms A and B of the Purdue Elementary Problem Solving Inventory (Feldhusen, et. al, 1972) were developed for use in the present study. The trial run served as a basis for providing item analysis and reliability data for the new test forms. Revisions of the items were made based on the results of

the pretest and posttest. One fourth-grade class was administered one of each of the two forms at each of the testing sessions, so that each test form could undergo two revisions during the trial run. Reliability, validity, and descriptive information of the two new forms will be presented in Chapter III.

The Main Study

The main study involved twelve classrooms from the Elkhart School Corporation from January 11, 1973 to April 16, 1973.

Subjects

All of the teachers who participated in the main study were also volunteers. Because of this, it was not possible to create a complete factorial design for socioeconomic status and ethnic background of students. Also, three teachers volunteered for only limited participation in the experiment. They did not wish to take away from their regular schedule the extra time required for the materials or games. Of the nine remaining classrooms, five contained students who were predominantly from a lower-middle class background, four contained students who were predominantly from a middle- and upper-middle-class background. The black students were all from the lower-middle class background.

Two upper-middle class classrooms were assigned to the training-plus-games group and two were assigned to the training-only group. The three limited-participation classrooms were

from an upper-middle class background and formed the control group. Three lower-middle class classrooms were assigned to the materials plus games group and two were assigned to the materials-only group. These assignments were not random, since the decision was made to be consistent in treatment within school. In other words, no two treatments were in the same school. Appendix B presents the names of the teachers, their school, the socioeconomic status and ethnic composition of their classes, and the group to which they were assigned.

Procedures

Teachers in the training plus games group and training only group met with E's from Purdue who explained the details of the program and provided them with the teacher's manual, a supply of worksheets, the grading stamps, and games for the games group. These meetings took place during the regular class day and on an individual basis. The Teacher's Manual is presented in the Appendix D. One E made weekly visits to all of the nine classrooms involved in training throughout the program to observe training and reward sessions, answer teachers' questions, and bring new materials.

Training Periods

All teachers provided approximately 15 to 30 minutes of work time per day in their classes. Because of differences in daily schedules, however, the work periods varied as to

time of day from teacher to teacher. Some of the work sessions were in the morning; some were in the afternoon. One of the objectives of the study was to test the materials under actual classroom conditions; thus, teachers were told to find a time most suitable to their own class organization. During the work periods, most of the students worked on their own at their desks. On the whole, the teachers did not allow much free talking or provide a great deal of introduction to the new worksheets. New vocabulary words were explained but discussion of possible answers after the work sessions was rare.

Materials

Forty-three worksheets were used in the main experiment. Each worksheet contained a cartoon drawing of children or adults in a problematic situation. Below the picture, questions were asked and lined spaces provided for the children to make responses. Each of the worksheets was designed to provide practice in one or more skills hypothesized to underlie general problem-solving behavior (Feldhusen, et. al, 1972). Appendix E presents the worksheets given to Ss during the project.

Stamp Grades

Each teacher in the two training groups evaluated student papers by means of stamp grades. Criteria were provided for each of the four stamps, described earlier, in the teacher's manual.

Teachers were told to vary the criteria if, in their opinion, a student was performing up to his capacity or showed marked improvement, even though his production was not as great as another child's.

Some teachers graded the papers during their free time or at home, while others graded the papers during the work periods. To help facilitate feedback to the students, a record sheet was given to each student to mark his stamp grades for the previous week's work. The students filled out their own record sheets and kep them in their folders along with previous worksheets. A copy of this record sheet is presented in Appendix F.

Games

The teachers in the training plus games group provided 30 to 45 minutes of free time twice a week to their students. A number of different games and activities were provided each teacher. A list is presented in Appendix A. The most popular of the activities are starred. During the free time periods, some children talked to their friends, worked on other class activities, spent time grooming themselves, read, or rested in addition to playing games. The instructions to teachers were to allow the children freedom not to play games and do something else if they wished, but not to make them do "catch-up" class work.

Duration

Pretests were given to all Ss on January 11th and 12th, 1973. The formal training began on January 15th and continued daily until March 14th. Holidays limited the number of school days to 41 days. Posttesting was done on March 15th and 16th. The retention tests were administered approximately four weeks later, on April 12th and 16th. Thus, the total main project lasted approximately fifteen weeks, while the actual training phase lasted nine weeks.

Instruments Used

Forms A and B of the Purdue Elementary Problem Solving Inventory, developed during the trial runs, were used as the pre- and post- tests, respectively. The original form of the inventory (Feldhusen, et. al, 1972) was used as the retention test. A transfer test was also administered at the time of the post-tests, and consisted of two all-verbal, real-life problem situations, to which children were to write as many possible solutions as they could think of. A copy of each of these instruments is included in Appendix C. In addition, IQ and achievement test data were collected from the schools for each child in the project. The IQ scores were obtained from the Lorge-Thorndike Intelligence Test and the Reading and Mathematics Achievement scores were obtained from the Iowa Tests of Basic Skills. Both tests were administered in the fall of 1972 to all fourth-graders in the Elkhart schools as part of the regular testing program.

Observations

A trained E, John C. Houtz, visited each school and teacher in the project once a week during the training program. His observations of work sessions and reward periods formed the basis for the descriptions of the implementation of the various parts of the program presented in this chapter. He answered teacher questions, provided them with reinforcement as to their interpretation of the teacher's manual, and helped teachers overcome difficulties.

Experimental Design and Statistics Used

Because a complete factorial design was not possible for the present experiment, several different analyses were performed. The first step was to obtain an intercorrelation matrix for all of the measures obtained in the project. Based on this data, to be reported in Chapter III, analyses of variance and covariance were computed:

1. To examine the effects of training, one-way analyses of covariance were used (three levels of training: training-plus-games, training only, and control). Pretest and IQ scores were used as covariates. One analysis was computed for each dependent variable: post test scores, retention test scores, and transfer test scores.
2. To examine the effects of training on weekly production of students, stamp grade averages were used as a fourth

dependent variable. A two-way analysis of variance was computed (two levels of training and four stamp grade averages taken at approximately two-week intervals during the training phase of the project), with stamp averages being treated as a repeated measure.

3. To examine the effects of sex, ethnic identity, and SES level, a series of two-way analyses of covariance were computed with post test, retention test, and transfer test scores. One set of analyses involved the factors of sex and all training levels; a second set of analyses involved SES (middle and lower-middle) and the two training groups (without the control Ss); and a third set involved ethnic identity (a one-way analysis).

CHAPTER III

RESULTS

This chapter will be organized into three major headings. First, the results of the development of the two new forms of the Purdue Inventory, Forms A and B, will be presented. Second, the results of the training program in terms of the three experimental groups will be reported. Finally, the performance of subjects by sex and from different socioeconomic and ethnic backgrounds will be presented.

Development of Forms A and B

For the purposes of the present experiment, two additional forms of the Purdue Problem Solving Inventory were needed. Items were generated using the same model described by Feldhusen, Houtz, and Ringenbach (1972) from an existing pool of items and subjected to pilot tests (See Chapter II). Table 1 presents the descriptive data on the new forms during the trial runs and on all forms during the main training project.

Correlations of Problem Solving with Other Achievement Measures

To establish the validity and reliability of the new forms of the Inventory, all measures used in the project were correlated. As can be seen from Table 2, Forms A, B, and the original Inventory resulted in a similar pattern of correlations with all other measures and moderate intercorrelations among themselves. The results of a factor analysis, a principal

components analysis with varimax rotation, demonstrated three factors: one on which the problem solving tests loaded highly, together with non-verbal IQ; one on which the IQ and achievement measures loaded highly, and one on which the transfer test and stamp grade averages loaded highly (See Table 3). These three factors accounted for 92.2 percent of the normalized variance of all of the scores.

As can be seen from Tables 1 and 2, however, the reliability of the new forms of the Inventory is low. As a result of this, the report of the results of the analyses of variance which follow must be interpreted with caution.

Table 1

Means, Standard Deviations, Standard Errors, Reliabilities, Number of Items, and Number of Subjects Taking Forms A, B, and the Original Purdue Problem Solving Inventory

	Mean	S.D.	S.E.	KR-20	K	N
Form A (Pretest)	26.17	3.97	2.98	.44	44	294
Form B (Posttest)	28.07	4.44	2.90	.57	44	308
Original (Retention)	35.65	5.10	2.33	.79	44	299
Form A (Second trial run)	29.84	3.90	2.97	.42	47	38
Form B (Second Trial run)	31.60	6.37	3.04	.77	50	50
Form A (First trial run)	28.72	4.17	3.03	.47	50	47
Form B (Second trial run)	29.31	5.45	3.07	.68	50	49

Table 2

Intercorrelations of Measures Used in the Main Training Project*

	B	Original	Transfer	IQ-V	IQ-NV	Read.	Math.
Form A	.54	.46	.28	.39	.38	.32	.29
Form B	-	.60	.36	.43	.46	.42	.21
Original Form		-	.37	.34	.41	.31	.19
Transfer			-	.43	.36	.39	.21
IQ-V				-	.78	.76	.59
IQ-NV					-	.64	.52
Reading						-	.60

*All correlations significant, $p < .01$.

Results of the Three Treatment Groups

To examine the effects of training upon Ss' performance, several criterion measures were selected: 1) performance on a posttest of problem solving ability (Form B); 2) performance on a retention test (the Original Form of the Purdue Inventory), given four weeks after the posttest; 3) performance on a transfer test composed of items similar to the actual training items; and 4) performance during the program, measured by stamp- grade averages. This latter measure was obtained by averaging the stamp grades received by Ss over two-week periods. Thus, four stamp grade averages were obtained, the last average covering the final three weeks of the program.

Since the twelve classrooms involved in the project were not assigned randomly to treatment groups, it was decided that analyses of covariance were to be used. Specifically, the control group of children appeared to be of a higher level of ability than the training with games or the training only groups. To determine if the three experimental groups were equal in terms of problem solving ability at the start of the project, an ANACOVA using IQ-Verbal scores as the covariate and pretest problem solving scores as the dependent variable was computed. The results of this analysis are presented in Table 4. No significant F-ratio was obtained.

Table 3

Factor Loadings of All Measures Used in the Main Training Project

	Factor 1	Factor 2	Factor 3
Form A	.05	.38	.45
Form B	.21	.25	.72
Original Form	.21	.16	.75
Transfer	.56	.31	.17
IQ-V	.33	.82	.16
IQ-NV	.25	.66	.45
Reading	.37	.73	.23
Math	.24	.55	.18
SG-1*	.77	.35	.18
SG-2	.89	.28	.06
SG-3	.87	.16	.22
SG-4	.87	.17	.18

*Stamp Grade Averages will be discussed later.

Table 4

ANACOVA of Pretest Problem Solving Scores (Form A) Using IQ-Verbal Scores as a Covariate

Source	df	M.S.	F	p
Groups	2	23.91	1.80	n.s.
Error	236	13.29		

Unit of Analysis

The present experiment made use of the individual Ss' scores as the unit of analysis. Campbell and Stanley (1963) suggest that class means may be used to control for the uniqueness of the classroom situation, but considerable controversy exists on this point (Wittrock and Wiley, 1970). Class means may result in very little power, that is, the probability of not rejecting the null hypothesis of no difference between groups when, in fact, one does exist. Since the primary objective was to determine the effects of training on student achievement, it was decided to use a more direct measure of student, the individual scores, and attempt to defend the rigor of the experimental design in terms of a Type I error, that is, rejecting the null hypothesis when, in fact, it is true.

Analyses of Covariance

Analyses of covariance were thus used to attempt to control for individual subject variation in ability level.

Covariates were selected based on the intercorrelations between measures used in the project. Verbal IQ scores were selected as one covariate since their correlation with other problem solving measures was significant and because they are used as a partial basis for assigning students to classes in the schools. Pretest problem solving scores were also used as a covariate for the posttest and retention test analyses since the purpose of the project was to assess, albeit indirectly, change in problem solving ability as a result of training.

For the first analysis, a one-was analysis of covariance was performed using IQ-V and pretest problem solving scores as covariates for posttest scores. Table 5 presents these results. A significant F-ratio was obtained and subsequent Newman-Keuls post hoc comparisons (Winer, 1971) were made. Table 6 presents the adjusted means and standard deviations for the three experimental groups. The training-only group outperformed both the training-plus-games ($p < .05$) and the control ($p < .01$) groups. The means for the training-plus-games and control groups did not differ significantly.

For the second analysis, the same two covariates were used for scores on the retention test. Table 7 indicates that a non-significant F-ratio was obtained and Table 8 presents the adjusted means and standard deviations of the three experimental groups.

The third analysis involved the transfer test scores and only IQ-Verbal scores were used as the covariate since pretest

scores were not substantially correlated with transfer scores. It should be recalled that the two tests consist of different types of items and attempt to assess different abilities. Table 9 shows that the F-ratio was significant and post hoc means comparisons indicated that the training-only group again significantly outperformed each of the other two groups ($p < .01$). This time, however, the training-plus-games also outperformed the control group ($p < .01$). Table 10 presents the adjusted means and standard deviations of the three groups on the transfer test.

Table 5

ANACOVA of Posttest Problem Solving Scores Using IQ-V and Pretest Scores as Covariates

Source	df	M.S.	F	p	w^2
Groups	2	80.09	6.49	.01	.044
Error	235	12.33			

Table 6

Adjusted Means and Standard Deviations of Posttest Scores for Each Treatment Group

Group	N	M	S.D.
Training-plus-games	105	27.65	3.59
Training-only	85	29.31	3.50
Control	50	27.45	3.54

Table 7

ANACOVA of Retention Scores Using IQ-V and Pretest Scores as Covariates

Source	df	M.S.	F	p	w^2
Groups	2	33.31	2.09	n.s.	.009
Error	235	15.95			

Table 8

Adjusted Means and Standard Deviations of Retention Scores for Each Treatment Group

Group	N	M	S.D.
Training-plus-games	105	35.72	4.10
Training-only	85	36.38	4.06
Control	50	34.93	4.03

Table 9

ANACOVA of Transfer Test Scores with IQ-V as a Covarate

Source	df	MS	F	p	w^2
Groups	2	405.83	26.25	.001	.172
Error	236	15.46			

Table 10

Adjusted Means and Standard Deviations of Transfer Test Scores for Each Treatment Group

Group	N	M	S.D.
Training-plus-games	105	8.28	4.00
Training-only	85	9.89	3.96
Control	50	4.83	3.96

The fourth analysis involved performance during the project. An ANOVA using the four stamp grade averages for each student was computed. Analysis of variance was used because only the two treatment groups were being compared. These two groups - training with games and training only - contained children of both high and low ability levels, so it was felt that the use of a covariate such as IQ or achievement would not contribute to the analysis.

Table 11 presents the intercorrelations of stamp grade averages with other measures used in the project. The results of the analysis of variance are presented in Table 12. A significant main effect due to Stamp Grades and a significant interaction of Stamp Grades and Treatment Group was obtained. Table 13 presents the related means and standard deviations of these groups. Post hoc comparisons indicated that the first,

second, and third work periods differed in mean performance from each other ($p < .01$), but that the third and fourth periods did not. The means in the fourth period of the two treatment groups who received training exercises differed, although not significantly, in direction in comparison to the third week's averages. The mean of the training-only group increased but that of the training-plus-games group decreased.

Performance of Subjects of Different Characteristics

Several analyses were computed to determine if S's sex SES background, or ethnic identity were relevant factors in the training program. On the posttest and retention test analyses, IQ-V and pretest scores were the covariates. On the transfer analyses, only the IQ-V scores were used as a covariate.

Table 11

Correlations of Stamp Grade Averages with Other Measures Used in The Main Training Project*

	SG-1	SG-2	SG-3	SG-4
Form A	.34	.25	.22	.22
Form B	.34	.31	.28	.29
Original Form	.40	.39	.37	.35
Transfer	.52	.54	.54	.57
IQ-Verbal	.52	.47	.32	.36
IQ-Non Verbal	.45	.39	.31	.30
Reading	.50	.45	.33	.40
Math	.41	.31	.19+	.32

*All correlations are significant, $p < .01$

+ $p < .05$

Table 12

ANOVA of Stamp Grade Averages by Treatment Group

Source	df	MS	F	p
Between Ss	225			
Groups	1	.61	.71	n.s.
Error	223	2.28		
Within Ss	675			
Stamp Grader	3	5.02	41.37	.01
Group x Grades	3	1.03	8.49	.01
Error	669	.120		

Table 13

Means and Standard Deviations of Stamp Grade Averages for Each Work Period and for Each Work Period by Treatment Group

	Work Period			
	I	II	III	IV
Main Effect		N = 260		
M	2.58	2.69	2.89	2.86
S.D.	.77	.83	.87	.88
Treatment-plus-games		N = 132		
M	2.57	2.70	2.85	2.74
S.D.	.74	.76	.81	.87
Treatment-only		N = 128		
M	2.58	2.67	2.94	3.01
S.D.	.80	.90	.94	.74

Males versus Females

Table 14 presents the results of the analyses involving Ss' sex. In the retention test and transfer test, the factor of sex was significant. Females outperformed males. Table 15 presents the appropriate means and standard deviations for both groups.

Socioeconomic Background

The control group Ss were from only a middle SES background, but both training groups were composed of Ss from a middle and a lower-middle SES background. The results of the ANACOVA are presented in Table 16. In all analyses, SES is significant. Table 17 presents the appropriate means and standard deviations. Middle-class Ss always outperformed lower-middle-class Ss.

Ethnic Identity

Only the two training groups contained Black Ss. Table 18 presents the results of the analyses of covariance. Using IQ-V as a covariate and the pretest as a dependent variable, significant differences were obtained between black Ss and white Ss before the project was begun. Table 19 presents the relevant means and standard deviations. Significant differences were obtained at the end of the project on the transfer test but not on the immediate posttest of problem solving or the retention test four weeks later.

Table 14

ANACOVAS of Posttest, Retention Test, and Transfer Test Scores by Treatment Group and Sex Using Pretest Scores as the Covariate

Source	df	MS	F	p	w^2
Posttest Scores					
Groups	2	133.27	10.23	.01	
Sex	1	26.58	2.04	-	.004
G x S	2	.10	.01	-	
Error	224	13.02			
Retention Scores					
Groups	2	52.38	3.09	-	
Sex	1	156.04	9.20	.01	.031
G x S	2	26.49	1.56	-	
Error	249	16.97			
Transfer Scores					
Groups	2	445.19	23.35	.01	.010
Sex	1	77.44	4.06	.05	
G x S	2	11.38	.60	-	
Error	245	19.07			

Table 15

Adjusted Means and Standard Deviations for Main Effects of Sex of Posttest, Retention Test and Transfer Test Scores

Posttest	N	M	S.D.
Males	125	28.03	4.44
Females	126	28.49	3.93
Retention Test			
Males	125	35.16	5.59
Females	126	36.36	3.31
Transfer Test			
Males	125	7.63	4.34
Females	126	8.63	4.39

Table 16

ANACOVA of Posttest, Retention Test, and Transfer Test Scores by Treatment Group and Socio-Economic Status

Source	df	MS	F	p	w^2
Posttest					
SES	1	159.27	14.86	.01	.067
Group	1	168.12	15.68	.01	
G x SES	1	2.24	.21	-	
Error	174	10.72			
Retention Test					
SES	1	58.00	5.77	.025	.026
Group	1	26.26	2.61		
G x SES	1	11.44	1.14		
Error	174	10.05			
Transfer Test					
SES	1	607.69	32.71	.01	.140
Group	1	307.56	16.55	.01	
G x SES	1	7.17	.39	-	
Error	175	18.58			

Table 17

Adjusted Means and Standard Deviations for Main Effects of SES on Posttest, Retention Test, and Transfer Test

	N	M	S.D.
Posttest			
Middle	92	29.17	3.23
Lower-middle	87	26.87	4.17
Retention Test			
Middle	92	36.56	3.51
Lower Middle	87	35.04	3.54
Transfer Test			
Middle	92	10.20	4.68
Lower Middle	87	6.79	3.88

Table 18

ANACOVA of Pretest, Posttest, Retention Test, and Transfer Test by Ethnic Group

Source	df	MS	F	p
Pretest				
Ethnic Group	1	104.74	8.75	.01
Error	102	11.97		
Posttest				
Ethnic Group	1	33.61	3.32	n.s.
Error	101	10.12		
Retention Test				
Ethnic Group	1	30.82	2.83	n.s.
Error	101	10.87		
Transfer Test				
Ethnic Group	1	16.46	5.43	.05
Error	102	89.37		

Table 19

Adjusted Means and Standard Deviations of Black and White Subjects on Pretest, Posttest, Retention Test, and Transfer Test Scores

	N	M	S.D.
Pretest			
Black Ss	29	24.60	3.58
White Ss	76	26.94	3.51
Posttest			
Black Ss	29	26.35	3.40
White Ss	76	27.73	3.27
Retention Test			
Black Ss	29	34.53	3.52
White Ss	76	35.85	3.39
Transfer Test			
Black Ss	29	6.17	4.20
White Ss	76	8.33	4.11

CHAPTER IV

DISCUSSION

Reliabilities of the New Forms of the Inventory

The reliabilities of Forms A and B are low, but the only measures obtained were those of internal consistency. The Kuder-Richardson Formula 20 (Hays, 1963), with which the present internal consistency measures were computed, depends upon the difficulty level of the items. Since the new forms were more difficult than the Original Form, a lower internal consistency measure was expected. The Original Form, however, yielded a .79 reliability, identical to that achieved in previous research (Feldhusen, et. al., 1972).

Because of the low Kuder-Richardson reliability estimates, the results of the present project must be interpreted with caution. It appears that the new forms A and B account for only approximately 20 to 36 percent of predictable variation in problem solving performance in the present project. These low reliabilities also imply that each child's scores could have varied by as much as three points on each test. An examination of the means in most analyses will reveal that a consistent three point variation would erase differences between the three treatment groups. Therefore, the most constructive conclusions that may be drawn from the results in the present experiment may be the suggestions that the behavior modification procedures and training materials need to be researched further.

Validity of the Problem Solving Measures

The results of the intercorrelations between the problem solving measures and IQ and achievement tests were quite similar to those obtained with the original form (Houtz, et. al., 1973). Significant but moderately large correlations were obtained. Since validity of an instrument is limited by its reliability, further test development on the forms of the Inventory should result in greater validity. Part of the reason for low intercorrelations between the three forms, however, may have been the 10 week interval between the administration of Forms A and B, and the additional 4 week interval between administration of Form B and the original form.

Treatment Differences

The results of the analyses involving posttest and transfer test scores demonstrated that the training exercises and procedures did improve subjects' problem solving abilities. The group which received the games and free-time reward for working on the worksheets outperformed the control group on both the transfer and posttest but did not, however, do as well as the group which did not have games or free-time reward. The group which made use of the worksheets as part of their regular classwork outperformed everyone else on the posttest and transfer test. The reason for this ordering of the groups may perhaps be explained by the analysis of stamp grade averages throughout the training program.

Stamp Grade Averages

The results of the biweekly stamp grade averages indicated that the games and free-time rewards were not continuously effective. No differences existed between the training-plus-games and the training-only groups on each of the first three bi-weekly averages. In addition, each weekly average increased significantly over the previous average. However, on the last period, the subjects' stamp grade average in the training-plus-games group decreased, while that of the subjects in the training-only group increased. It appears that the games and rewards made little difference during the program up to the last two or three weeks, and may have, in fact, interfered with performance during the last few weeks. Such interference may have manifested itself in a "reversal" of the Premack Principle. In other words, the games, rather than losing their effectiveness as rewards, may have become too much of an enjoyable alternative, so that time spent on the worksheets became disagreeable to subjects.

This possible "reversal" of the Premack Principle may be extremely important if the generalizations and procedures of behavior modification research are to be applied to normal classrooms on a group basis where the teacher or experimenter is not in a continuous individual relationship with each student. It is possible that particular rewards will lose their effectiveness over long periods of time or that less probable behaviors, such as study or work behaviors, will

acquire their own, secondary, reinforcing properties, but the results of this investigation may indicate that a third possibility exists: that rewards may make the less probable bheavior even less probable by an intrinsic comparison of "enjoyment" value between the rewards and the goal behaviors upon which reward is contingent.

Because of the "groupness" of the present project, the rewards may have also become too much of a regularity in the games groups. That is, if group contingency procedures are to be employed in classroom training projects, one must be careful that students do not collectively decrease output because the rewards are "almost guaranteed." In the present project, this possibility exists by the seventh week, certainly the novelty of the materials and rewards had "worn off," and both teachers and student may have established a routine which diminished the strength of the relationship between work and rewards. Since no differences ever existed between the games and no-games classes, the possibility exists that such a relationship was never very strong at all.

Results on the Retention Test

The three treatment groups did not differ significantly on the retention test. This result may have been due, in part, to the high easiness level of the test, itself, but an additional problem is related to the skills practiced during the training

program which may have added to the disappearance of effects on the retention test. The skills practiced on the worksheet exercises involved the generation of a large number of responses to a number of different types of problem situations. These responses were evaluated in terms of quantity and quality, or relevance, by the teachers. The stamp grades were intended to reflect this evaluation and so provide evaluative feedback to students. Teachers were encouraged to discuss with their classes responses to problems they thought were especially good.

Observations of the classes, however, revealed that few discussions were held and teachers, for the most part, graded papers on quantity without giving much attention to the relevance of the students' responses. Without appropriate feedback, subjects' experienced much practice in generating ideas, but little practice in evaluating them. The Purdue Inventory presents similar problem situations, but requires students to evaluate alternatives. Factor analysis of the Inventory has demonstrated the large evaluative component (Speedie, et. al., 1973).

Thus, differences between groups did not appear on the retention test perhaps because the few evaluative skills developed by students and reflected in the posttest were not stable and soon disappeared. This event can be supported statistically by the degrees of association computed for each analysis (Hays,

1963). The amounts of variance accounted for by the treatment groups in each of the analyses of posttest, transfer, and retention test show clearly the relationship of the types of skills practiced and test performance. On the transfer test, which consisted of problem situations calling for multiple answers, the degree of association was .172; that is, approximately 17% of the total variance can be attributed to treatment effect. On the other hand, on the posttest and retention test, the degrees of association were .044 and .009, respectively. The transfer test measured the exact abilities practiced during the project, while the posttest and retention tests added a new component: the evaluation of alternative responses.

Differences Between Boys and Girls

No differences between girls and boys were obtained on the posttest, but significant sex differences did appear on the transfer test and the retention test. Differences on the transfer test may have been due, in part, to the high relationship between the transfer test and IQ-Verbal scores. The transfer test calls for fluency and writing skills on the part of subjects and these skills are more likely to reflect sex differences, as do general measures of verbal intelligence. On the other hand, differences on the retention test can perhaps be attributed to the control group of subjects, where girls outperformed boys by an average of four points. This result may have been, in part, a function of the third testing of these subjects.

In contrast to the training groups, the control subjects did not "appreciate" the E's third visit, perhaps because they were bored or annoyed at being tested so frequently.

Socioeconomic status and ethnic differences

On all analyses, SES differences appeared. In general, such differences probably reflect the overall achievement level of subjects. The Premack method or the materials were apparently not powerful enough to eliminate such a large influence on achievement. The percent of variance accounted for by the SES factor ranged from 2.6% to 14%.

In the analyses of ethnicity, with IQ controlled via covariance analysis, significant differences between black students and white students were present on the pretest of problem solving. Similar differences were obtained at the end of the project on the transfer test, probably due again to the poorer performance of blacks in terms of general verbal achievement. However, on the posttest and retention test of problem solving, no significant ethnic differences were found. Apparently, the exercises increased black students' abilities to a level equal to that of white students. Caution must be used when interpreting the results of this analysis since relatively few black students were included in the present investigation compared to the number of white students. In addition, all of the black students were from schools classified as lower-middle socioeconomic status.

This final result is obviously important but must, because of the weakness of design in the present study and low reliability of the instruments used, be investigated further. If it can be established that the worksheet exercises or, perhaps more appropriately, the regularity and format of the exercises, significantly contributed to the development of problem solving abilities of non-white children to a level equal to that of white children, their application would certainly be enormous.

Summary

In summary, three important findings were obtained from the present project. One, the training exercises were effective in increasing subjects' ability to generate a number of alternatives to problem situations and, to a lesser extent, the ability to select the most appropriate solution. These results did not remain on the retention measure, however, and may reflect the lack of adequate evaluative feedback on the "worth" of the ideas subjects generated during the project. Second, the games and free-time group did not outperform the training-only group during the project. In fact, the games may have resulted in subjects actually coming to resent the exercises and decrease performance towards the end of the project. This phenomenon has briefly been described as a "reversal" of the Premack Principle, in that the more favorable activity

comes to make the contingent goal behavior--work on the materials--even more unfavorable. This event may be particularly critical if behavior modification principles are applied in group situations where teachers and experimenters cannot reach all students on an individual basis and thus detect quickly when students may become dissatisfied with the new procedures. And, finally, the materials appeared to increase the achievement of black students more than white students, even to the point of erasing significant differences which previously existed between the two groups. Because of the limitations of the design of the present experiment, this final result, especially, must be examined further.

CHAPTER V

NEW PROPOSAL

Suggestions for Future Work

The present investigation has generated three major findings which, because of the limited design employed, must be studied further. The purposes of the next research project should be to establish the reliability of the improvements made with the materials, the "reversal" of the reward operation of the free time and games in relation to the worksheets, and the effectiveness of the materials with non-white students.

To accomplish these three objectives, several steps need to be taken. First, equal numbers of black and white students should be sampled beforehand, and these students should be selected from several socioeconomic classes so that a complete factorial design may be employed and all main effects and the possible interaction can be detected. Second, during the training phase of the project, more attention must be directed to the evaluative component of the materials. This may be accomplished by additional teacher training in class discussions and less overt emphasis on the number of alternatives required on each worksheet.

In the next experiment, it will be possible to use results from the present project to provide teachers with sample responses to situations on the worksheets. This will

also help teachers place more emphasis on the evaluation of student ideas. In addition, new exercises should be created which focus on evaluative abilities. For example, students may be asked to choose between several alternatives and explain all of his reasons for his choice. Finally, to provide a more workable schedule of exercises and rewards so that teachers have the time to carefully evaluate student responses, fewer exercises per week could be required and special review or discussion time could be included.

Another addition to the next experiment should be the inclusion of the transfer measure on the retention test and the use of a more equivalent retention form. The high easiness of the original form of the Purdue Elementary Problem Solving Inventory perhaps masked retention differences in the present study. Forms A and B were constructed using the same model as the original inventory and attention was paid to item analyses so that more difficult items were selected. A high priority in future work, however, must be to increase the reliability of the Test forms, especially that of Forms A and B. Because higher reliability will mean lower standard error; that is, more reliable differences between people, the effects of the training materials in general and with children from specific ethnic and socioeconomic backgrounds can only be assessed with confidence if the instruments possess a high degree of accuracy.

Results of Weekly Observations

The weekly observations made by the present investigators made it clear that the nine teachers involved in the training phase of the project varied considerably in their class manner and organization. On the one hand, this variability adds to the external validity of the present results since, despite non-uniform applications of the materials or different teacher styles and personalities, significant results were still obtained. On the other hand, the internal validity of the investigation may suffer if it can be determined that a selection by treatment interaction has occurred (Campbell & Stanley, 1963). In other words, if one treatment appeared to yield better results (i.e. a main effect), this effect may be due to a big increase within only one teacher's class. In the present study, all classes improved from pretest to posttest, but two of the training-only teachers' gained more than any other classes. In future studies, nested factorial analyses could be conducted or more teachers could be involved to minimize the selection by treatment interaction. If sufficient numbers of teachers are involved, the unit of statistical analysis could be the class means rather than the individual student.

The most significant finding of the weekly observation was that such observations were extremely helpful, both to the teachers and to the experimenter to determine exactly how treatments were being implemented, how inevitable questions and problems had been solved, and to maintain a working relationship between the teachers and the experimenter. In the next experiment, such observations should be continued.

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APPENDIX A

Games Used in the Project

Games Used as Rewards in the Free Time Periods
in the Training Project

	Popularity
Books	
Fairy tales, mysteries, adventure	Low
Peanuts Books	High
Card games (Whitman)	
Snap, Crazy Eights, Who's the Thief, Animal Rummy, Old Maid	Low
Chinese Checkers	High
Regular checkers	High
Pick-up sticks	Low
Dominoes	Low
Ring-toss (Indoor horseshoes)	High
Board games (Milton Bradley)	
Parchese, Funcky Phantom, Park and Shop, Picnic Treasure Hunt, Pirate and Traveler, Hardy Boys, Kentucky Derby	Low
Jigsaw puzzles	Low
Water colors	High
Chess	High
Magnetic dart game	High

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APPENDIX B

Teachers, their school and its socio-economic classification, and treatment group to which they belong

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Teachers, their school and its socioeconomic classification and treatment group to which they belong

Teacher	School	SES	Group
Mr. Boyland	Riverview	Upper-middle	Trial-run
Mrs. Miller	Riverview	Upper-middle	Trial-run
Ms. Staley	Riverview	Upper-middle	Trial-run
Mrs. Slaughter	Riverview	Upper-middle	Trial-run
Mr. Martin	Osolo	Middle	Games
Mrs. Bussard	Osolo	Middle	Games
Ms. Welch*	Roosevelt	Lower-middle	Games
Mrs. Knapp*	Roosevelt	Lower-middle	Games
Mr. Troyer*	Roosevelt	Lower-middle	Games
Ms. Riggs	Rice	Lower-middle	No games
Mrs. Kauffmann*	Lincoln	Lower-middle	No games
Mrs. Coe	Mary Feeser	Middle	No games
Mr. Miller	Mary Feeser	Middle	Control
Ms. Krempec	Cleveland	Middle	Control
Mrs. Hile	Cleveland	Middle	Control
Mrs. Ronk	Cleveland	Middle	Control

*Their classes contained black students; all other classes had no black students.

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APPENDIX C

Test forms and scripts for the pretest (A), posttest (B), retention test (Original Inventory) and the transfer test

NAME_____

GRADE_____

BOY___GIRL____

1. A. The boy would rather watch cartoons.

   B. The boy's favorite football team is losing.

   C. The boy's father won't play with him.

---

2. A. The boy is crying because he fell and dropped his boat.

   B. He is crying because his boat floated away.

   C. He is crying because he doesn't know where his boat is going.

---

3. A. The boy sees something that frightens him.

   B. The bear will knock down the tent.

   C. The boy is afraid the bear will eat his fish.

---

4. A. This boy is daydreaming in class.

   B. He has a lot of jobs he must do.

   C. He is doing too many things.

---

5. A. There is no place to put the table.

   B. The table is too big for the door.

   C. The table is turned the wrong way.

---

6. A. Yes

   B. No

   C. Don't know

---

7. A. Yes

   B. No

   C. Don't know

---

8. A. Yes

B. No

C. Don't know

---

9. A. Why are the boys crying?

B. Why are they pulling on the tree?

C. Is the dog a watchdog?

---

10. A. Are they planting the tree?

B. Why is the girl running toward the boys?

C. Is the small boy her brother?

---

11. A. Whose dog is it?

B. Did the girl come out of the house?

C. Why is the dog barking?

---

12. A. Has the bus come yet?

B. How much money do you have?

C. Is it too far to walk home?

---

13. A. When was the baby fed?

B. Does he like the rattle?

C. How long has he been crying?

---

14. A. It was the white car's turn to go.

B. The black car slid on the ice.

C. The black car was driving too fast.

---

15. A. He forgot to do his homework.

B. He can't think of anything to do.

C. His schoolwork is too hard.

---

15. A. His brother has the comics.

B. He can't find a job.

C. He read something bad in the paper.

---

17. A. What street is the A & P store on?

B. What is the A & P store near?

C. How far is it to the A & P store?

---

18. A. Should we use pencil or pen?

B. Should the paper be long or short?

C. When is the paper due?

---

19. A. Who has had the doll more?

B. Do both girls have dolls?

C. What else is there to play with?

---

20. A. The shirt.

B. The tie.

C. The shoes.

---

21. A. The tie.

B. The shoes.

C. The pants.

---

22. A. As a treat for his dog.

B. As the end of a rocket ship.

C. As something to hold candy in.

---

23. A. The table.

B. The umbrella.

C. The cabinet drawers.

---

24. A. He might get wet and catch cold.

B. He might lean too far forward.

C. He might rip his kite.

---

25. A. He might drop the bulb.

B. He might slip.

C. He might get a shock.

---

26. A. The windows will break.

B. Water won't come out of the faucets.

C. Winter will be very long.

---

27. A. Someone will buy them real instruments.

B. Someone may come and tell them to leave.

C. Other children will join them.

---

28. A. Take it to a garage.

B. Hold it under water in the tub.

C. Try to float it in the tub.

---

29. A. Run up the stairs.

B. Throw a heavy box on the stairs.

C. Hammer some more nails in the stairs.

---

30. A. The neighbor's house.

B. How deep the snow is.

C. The window next to the door.

---

31. A. What is lying on the floor?

B. Why is the dog barking.

C. Where will he set the books on the shelf?

---

32. A. How thick the ice is.

B. Where the hole in the ice is.

C. How strong the board is.

---

33. A. What color they should paint the house.

B. Whether the dog will like the house.

C. Whether they should change the house.

---

34. A. Put a bucket under the leak.

B. Put on their rainhats.

C. Hold an umbrella above their heads.

---

35. A. Get more string for the kite.

B. Run faster.

C. Put a tail on the kite.

---

36. A. Turn on the record player.

B. Move to another room.

C. Yell out the window.

---

37. A. Use only one color of paint.

B. Put newspaper on top of the table.

C. Wash his brushes when he's done.

---

38. A. In the middle of the room.

B. In boxes under the bed.

C. In somebody's else's room.

---

39. A. Get some water from the lake.

B. Wait for help.

C. Start walking to a gas station.

---

40. A. Empty out the drawers.

B. Carry it up just like it is.

C. Carry the drawers up first.

---

41. A. Yes

B. No

C. Don't know.

---

42. A. Yes

B. No

C. Don't know.

---

43. A. Yes

B. No

C C. Don't know

---

44. A. Yes

B. No

C. Don't know

---

45. A. Yes

B. No

C. Don't know.

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PRETEST - FORM A

Script

Hello, boys and girls. We are going to do something today we think you will enjoy. We are going to show you some cartoon pictures like this one on the screen. (Show slide) When we show you a picture, we want you to look at it closely, so that you can answer questions about the picture. (PAUSE).

Open your booklets to the first page. Look at the three answers next to number 1. Here is the next picture (show slide). This is an example we can all do together. What do you think is the problem in this picture? You circle the letter of the answer you think is best.

A. The boy would rather watch cartoons.

B. The boy's favorite football team is losing.

C. The boy's father won't play with him.

Circle the letter in front of the answer you want (PAUSE 7 sec) This time I'm going to tell you the right answer. A is right. The boy would rather watch cartoons. (PAUSE)

Now we will do some more, but I will not tell you the answer each time. You circle the letter of the answer you want. Here is number 2. (show slide). What is the problem here?

A. The boy is crying because he fell and dropped his boat.

B. He is crying because his boat floated away.

C. He is crying because he doesn't know where his boat is going.

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Circle the letter in front of the answer that you think tells what the problem is. (PAUSE 7 sec.)

Number 3. (Show slide) What is the problem in this picture?

A. The boy sees something that frightens him.

B. The bear will knock down the tent.

C. The boy is afraid the bear will eat his fish.

(PAUSE 7 sec.)

Number 4. (Show slide) What is the problem in this picture?

A. This boy is daydreaming in class.

B. He has a lot of jobs he must do.

C. He is doing too many things.

(PAUSE 7 sec.)

Number 5. (Show slide) What is the problem in this picture?

A. There is no place to put the table.

B. The table is too big for the door.

C. The table is turned the wrong way.

(PAUSE 7 sec.)

OK, here is number 6. (Show slide) Listen carefully.

These kids have to plan a party for Halloween. Their problem is that they must have quite a bit of money, they need the teacher's permission, and the party must be held on a day when there are no other big events. They find out that they have the money, and October 29th is a good day. Do they have enough information to go ahead planning the party?

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Circle A if you think they have enough information; circle B if you think they do not have enough information, or circle C if you don't know or aren't sure if they have enough information.

(PAUSE 7 sec.)

Number 7. (Show slide). Listen carefully.

This boy wants to get rid of some newspapers. He decides to take them to the city dump in his wagon. He knows that the city dump is ten blocks north of his house and that it will take him two trips in his wagon. Does he know everything he needs to know to take the papers to the dump? Circle the letter you want.

(PAUSE 7 sec.)

Now turn to page 2.

Number 8. (Show slide). Listen carefully.

These children have decided to get a dog as a mascot for their club. They have enough money and they have their parents' permission. Do they have to talk about anything else before they get the dog? Circle the letter you want.

(PAUSE 7 sec.)

Here is a different kind of problem (show slide). I am going to ask you to pick the best question to ask to find out what is going on in the picture. Here is number 9. Look closely at the picture.

Which of these questions would be best to ask to find out what is going on?

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A. Why are the boys crying?

B. Why are they pulling on the tree?

C. Is the dog a watchdog?

(PAUSE 5 sec)

Number 10. (Same slide)

Here are 3 more questions about the same picture. Which one would be best to ask?

A. Are they planting the tree?

B. Why is the girl running toward the boys?

C. Is the small boy her brother?

(PAUSE 5 sec.)

Number 11. Here are three more questions. Pick the best one to ask.

A. Whose dog is it?

B. Did the girl come out of the house?

C. Why is the dog barking?

(PAUSE 5 sec.)

Number 12. (Show slide) Here is a new picture.

Which of these questions would be the best to ask this boy so we can figure out what his problem is?

A. Has the bus come yet?

B. How much money do you have.

C. Is it too far to walk home?

(PAUSE 5 sec).

Number 13 (Show slide) Here is another picture.

This girl wants her baby brother to stop crying. What would be the best question for her to ask her Mother if she wanted to find out what is wrong?

A. When was the baby fed?

B. Does he like the rattle?

C. How long has he been crying.

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(PAUSE 5 sec.)

Now I am going to ask you to figure out the causes of the trouble.

Here is number 14. (Show slide) These cars have just had a smashup.

Which of these three choices is the best guess of the cause of the accident?

A. It was the white car's turn to go.

B. The black car slid on the ice.

C. The black car was driving too fast.

(PAUSE 5 sec.)

Now turn to page 3.

Number 15. (Show slide)

This boy looks upset. What is probably the matter with him?

A. He forgot to do his homework.

B. He can't think of anything to do.

C. His school work is too hard.

(PAUSE 5 sec.)

Number 16. (Show slide)

This boy is sad. What is the most likely cause?

A. His brother has the comics.

B. He can't find a job.

C. He read something bad in the paper.

(PAUSE 5 sec.)

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Number 17. Now I am going to ask you to pick some questions to ask again. Look at this next picture (show slide).

Imagine yourself at the corner of Main and Oak streets. You want to get to the A & P store. What do you need to know to get there? Which of these three questions would be best for you to ask to find out how to get to the A & P?

A. What street is the A & P store on?

B. What is the A & P store near?

C. How far is it to the A & P store?

(PAUSE 5 sec.)

Number 18 Here is a new picture.

Imagine yourself as a student in this class. You have been asked to write a paper about the class trip to the zoo. What question should you ask?

A. Should we use pencil or pen?

B. Should the paper be long or short?

C. When is the paper due?

(PAUSE 5 sec.)

Number 19

These girls are arguing over who should play with the doll first. If they wanted to solve the argument what should they talk about?

A. Who has had the doll more?

B. Do both girls have dolls?

C. What else is there to play with?

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(PAUSE 5 sec.)

Here are some different problems. Number 20. (show slide).

This girl is making a doll out of old clothes and things she has found. What can she use or use part of, to make a face for the doll?

A. The shirt

B. The tie

C. The shoes

(PAUSE 5 sec.)

Now turn to page 4.

Number 21. (same slide)

What could she use, or use part of, to tie the doll's hair into two pigtails?

A. The tie

B. The shoes

C. The pants

(PAUSE 5 seconds)

Number 22. Here is a new picture (show slide)

One of these children has dropped his ice cream. What is the wierdest way he could use the empty cone?

A. As a treat for his dog.

B. As the end of a rocket ship.

C. As something to hold candy in.

(PAUSE 5 sec.)

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Number 23. (show slide)

This boy can't reach the cookie jar. Which of these things could he use to get some cookies?

A. Table

B. Umbrella

C. Cabinet drawers

(PAUSE 5 sec.)

Here is the next picture. Number 24 (show slide)

This boy is trying to get his kite down. What might happen?

A. He might get wet and catch cold.

B. He might lean too far forward.

C. He might rip his kite.

(PAUSE 5 sec.)

Number 25. (show slide)

This boy is going to stand on the chair to change the light bulb. What might happen?

A. He might drop the bulb

B. He might slip

C. He might get a shock

(PAUSE 5 seconds)

Number 26 (show slide)

The furnace went out in this boy's house and it is getting cold. What might happen if the furnace isn't fixed and his house stays cold?

A. The windows will break

B. Water won't come out of the faucets

C. Winter will be very long

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(PAUSE 5 sec.)

Number 27 (show slide)

These boys are trying to make music by banging on some trash cans. What might happen?

A. Someone will buy them real instruments.

B. Someone may come and tell them to leave

C. Other children will join them

(PAUSE 5 seconds)

Now turn to page 5.

Number 28 (show slide)

This boy wants to blow up his inner tube, but he thinks it has a hole in it. How could he check to see if it has a hole?

A. Take it to a garage.

B. Hold it under water in the tub

C. Try to float it in the tub

(PAUSE 5 sec.)

Number 29 (show slide)

These boys are exploring an old house. One boy is testing the stairs to see if they are still strong. How else could he test the stairs?

A. Run up the stairs

B. Throw a heavy box on the stairs.

C. Hammer some more nails in the stairs

(PAUSE 5 sec.)

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Number 30. Here is a different problem (show slide)

This boy came home after playing to find no one home and the door locked. What should he be sure to notice?

A. The neighbor's house

B. How deep the snow is

C. The window next to the door.

(PAUSE 5 sec.)

Number 31 (show slide)

This boy wants to put the books on the shelves. What should he be sure to notice or think about. Pick the most important from these three.

A. What is lying on the floor?

B. Why is the dog barking?

C. Where will he set the books on the shelf?

(PAUSE 5 sec.)

Number 32 (show slide)

This boy is trying to get his cap back. What should he be sure to notice or think about?

A. How thick the ice is.

B. Where the hole in the ice is.

C. How strong the board is.

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(PAUSE 5 sec.)

Number 33 (show slide)

These boys have built a doghouse. What should they think about now?

A. What color they should paint the house.

B. Whether the dog will like the house.

C. Whether they should change the house.

(PAUSE 5 sec)

Number 34 (show slide)

These children have noticed a leak in the roof. What should they do to keep everything from getting wet?

A. Put a bucket under the leak.

B. Put on their rainhats.

C. Hold an umbrella above their heads.

Now turn to page 6

Number 35 (show slide)

This boy and girl can't get their kite to fly. What could they do to get it to fly?

A. Get more string for the kite.

B. Run faster.

C. Put a tail on the kite.

(PAUSE 5 sec.)

Number 36 (show slide)

This boy has to do his homework but is bothered by the noise outside his window. What should he do?

A. Turn on the record player.

B. Move to another room.

C. Yell out the window.

(PAUSE 5 sec.)

BEST COPY AVAILABLE

Number 37 (show slide)

This boy is going to paint his new model. What should he do now to make it easier to clean up later on.

A. Use only one color of paint.

B. Put newspaper on top of the table

C. Wash his brushes when he's done

(PAUSE 5 sec.)

Number 38 (show slide)

This girl's room is very crowded. She needs some more room to store things. Where should she put them?

A. In the middle of the room.

B. In boxes under the bed

C. In somebody else's room

(PAUSE 5 sec.)

Number 39 (show slide)

This family's car has overheated. What would be the best thing for them to do now?

A. Get some water from the lake

B. Wait for help

C. Start walking to a gas station.

(PAUSE 5 sec.)

Number 40 (show slide)

These boys have to move the dresser upstairs. What is the best way for them to do it.

A. Empty out the drawers.

B. Carry it up just like it is.

C. Carry the drawers up first.

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Now turn to page 7. Now I am going to ask you to tell me if you think there is a problem in the picture. All you have to do is mark yes if you think there is a problem, no if you think there is no problem, or you can mark "don't know" if you are not sure.

Here is number 41. Is there a problem here. Mark yes, no, or don't know. (PAUSE 5 sec.)

Number 42

Is there a problem here? Circle the letter you want. (PAUSE 5 sec.)

Number 43. (show slide) Is there a problem here? (PAUSE 5 sec.)

Number 44. (show slide) Is there a problem here? (PAUSE 5 sec.)

Number 45 (show slide) Is there a problem here? (PAUSE 5 sec.)

Posttest (Form B) and Transfer Test

Script

Hello, boys and girls. We are going to do something today we think you will enjoy. We are going to show you some pictures like this one on the screen. When we show you a picture, we want you to look at it closely, so that you can answer questions about the picture. (PAUSE)

Open your booklets to the first page. Let's do one together as an example. Look at the three choices next to number one. Here is the next picture (show slide). What do you think is the problem in this picture.

A. The cat was lost

B. The mother does not want the cat

C. The cat ran away.

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Put a circle around the letter of the answer you think tells what the problem is. (PAUSE 7 sec.)

OK, this time I'm going to tell you the correct answer. B is correct. It looks as though the girl's mother doesn't want the cat.

Now you can do the rest on your own. I will not tell you the answers each time.

Here is number 2. Look closely at this picture. What is the problem here?

A. The boy broke the dog's rope.

B. The boy thinks his dog has run away.

C. The dog might knock over the garbage can.

(PAUSE 7 sec.)

Number 3. What is the problem here?

A. The girl is wondering how to play the game.

B. The girl wonders what she should do next.

C. The girl wonders if she is missing a playing piece.

(PAUSE 7 sec.)

Number 4. What is the problem here?

A. It is cold in the room.

B. It is cold outside.

C. The boy is frightened.

BEST COPY AVAILABLE

(PAUSE 7 sec.)

Number 5. What is the problem here?

A. The boy is writing a story about baseball.

B. He has to do his homework.

C. He doesn't see his friends.

(PAUSE 7 sec.)

Number 6. Listen carefully.

This boy wants to build a model airplane. He knows that he needs a razor blade, glue, blue and yellow paint, and a ruler. He gets a razor blade from his father, a ruler from his desk, and glue from the basement. Does he have everything he needs? Circle "A" for yes, "B" for No, or "C" for Don't know.

(PAUSE 7 sec.)

Number 7. Listen carefully again. Here is a different picture. (show slide)

These kids were out playing and found some empty purses, an empty jewelry box, and three spoons. There was a house nearby. Do they have enough information to call the police and say that someone robbed the house.

A. Yes

B. No

C. Don't know

BEST COPY AVAILABLE

(PAUSE 7 sec.)

Now turn to page 2.

Number 8. (show slide) Listen carefully.

The teacher wants these kids to write a report on their trip to the farm. One boy knows that the farm was near Chicago, they took a bus to get there and they saw some cows and chickens. Does he know everything he needs to write the report?

A. Yes

B. No

C. Don't know

(PAUSE 7 sec.)

Now, we are going to do something different. I want you to choose the best question to ask to help you figure out what is going on in the picture. Here is number 9. (show slide)

Which one of these questions would be the best one to ask if we want to figure out what is going on?

A. Who put the bench where it is?

B. Why is the woman scolding the boys?

C. Whose books are on the floor?

(PAUSE 5 sec.)

Number 10. (same slide)

Which one of these questions would be best for you to ask?

A. Were the 3 boys mean to the small boy?

B. Who put the books on the floor?

C. What did the small boy do?

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Number 11. Here is another picture. (show slide)

These two boys seem to fighting. What would be the best question to ask to find out what is going on?

A. Are the two boys friends.

B. Why is the other boy standing there?

C. Why did the two boys begin to fight?

(PAUSE 5 sec.)

Number 12. (show slide)

This boy looks angry. If we wanted to find out what happened, what would be the best question to ask?

A. Did the dog run away?

B. Where has he been?

C. Where are they going?

(PAUSE 5 sec.)

Now I am going to ask you to try to figure out the causes of the problem. Here is number 13. (show slide) These cars just had a smashup.

What is the most likely cause of the accident?

A. The black car slid on ice.

B. The white dar was going too fast.

C. The sun blinded the driver of the black car.

(PAUSE 5 sec.)

Number 14. (show slide)

This boy has just dropped his ice cream scoop. What is most likely the cause?

A. Someone bumped the boy.

B. The scoop slipped off the cone.

C. The ice cream was melting.

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Now turn to page 3.

Number 15. (show slide)

This hammer broke while hitting a nail. What is most likely the cause.

A. The hammer was too old.

B. The wood was too hard.

C. The nail was too big.

(PAUSE 5 sec.)

Number 16 (show slide)

Imagine that you wanted to use the inner tube shown in this picture. What do you need to know before you can use it?

A. How much air does the tire hold?

B. Is there an air pump nearby?

C. Does the tire need patching?

(PAUSE 5 sec.)

Number 17. (show slide)

These kids are on a committee. The committee must give a report about the Indian Geronimo. Which one of these questions should they ask the teacher to be sure they know what to do?

A. Can we go to the library?

B. Did Geronimo fight General Custer?

C. How long should the report be?

(PAUSE 5 sec.)

Now we are going to do something different again. Look at the next picture. Number 18. (show slide)

This family's car has overheated. There is a pond nearby. What could they use to carry water to the car?

A. A newspaper.

B. A shoe.

C. Their hands.

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Number 19. (show slide)

This boy can't reach the cookie jar. Which of these things could he use to get some cookies?

A. The table

B. The umbrella

C. The cabinet drawers.

(PAUSE 5 sec.)

Number 20, (show slide)

This boy went down to the basement to play. He decided to make a play town out of some things he found there. He wanted to

pretend that the town was real and that a flying saucer had landed in it. He imagined that the police ran out of the police station to see what had landed. What thing could he use for a jail cell?

A. The window

B. The lock

C. The bird cage

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(PAUSE 5 sec.)

Number 21. (small slide)

Before the police could get to the saucer, the boy imagined it took off, flying past a tall building and up toward the sun. What could he use for the tall building?

A. The bookcase

B. The record player

C. The doll house

(PAUSE 5 sec.)

Now turn to page 4.

Number 22 (same slide) What could the boy use for the sun?

A. The mirror

B. The lampshade

C. A record

(PAUSE 5 sec.)

Now, here are some different problems. Number 23. (show slide) If no one remembers to take this pan off the stove, what will probably be the first thing to happen?

A. A fire will start.

B. The bottle will break.

C. The water will boil over.

(PAUSE 5 sec.)

Number 24. (show slide)

What will happen if the girl in this picture mixes the two bottles of paint together?

A. She will get a pink color.

B. She will probably spill it.

C. Some of the paint will dry up.

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Number 25. (show slide)

This boy wants to stop water from running out of the hose. What will happen if he puts the rock on the hose?

A. The hose will break

B. The rock will not stay on the hose

C. The water will stop coming out.

(PAUSE 5 sec)

Number 26 (show slide)

This girl has decided to give her pet cat to a friend. What should her friend do before taking the cat?

A. buy some food for the cat

B. make friends with the cat

C. ask her mother if she may keep the cat

(PAUSE 5 sec.)

Number 27 (show slide)

This girl is finishing a test in school. She has time left over. What should she do?

A. Go over her work again.

B. Ask the teacher what to do.

C. Copy her answers over.

(PAUSE 5 sec.)

Number 28. (show slide)

These two kids have just bought some Coke and a toy in this store. What should they do before they go home?

A. Put the change in a pocket

B. Be sure the change is correct

C. See if they like the toy

(PAUSE 5 sec.)

BEST COPY AVAILABLE

Now turn to page 5.

Number 29 (show slide)

This boy and girl are fixing a leak in the roof. How could they check to see if there are any other leaks?

A. Put buckets under the leaks

B. Hold their hands out for drips

C. Look for water on the ceiling

(PAUSE 5 sec.)

Number 30 (show slide)

These boys are going into an old abandoned house. What should they watch out for?

A. The stairs might break down.

B. There may be lots of junk lying around.

C. Someone might come and chase them away.

(PAUSE 5 sec.)

Number 31 (show slide)

This boy wants to put a poster up in his room. What should he be sure to think about?

A. Whether somebody is sleeping.

B. Whether the nails are big enough.

C. Whether the nails will hurt the wall.

(PAUSE 5 sec.)

Number 32 (show slide)

If you wanted to put some more boxes on these shelves, what is the first thing that you should notice or think about?

A. How heavy the boxes are.

B. How weak the second shelf is.

C. Will everything fit on the shelves.

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Number 33. (show slide)

What should these boys be sure to notice or think about?

A. The kite is no good because it is torn.

B. The ladder is too far from the tree.

C. The ladder is not tall enough.

(PAUSE 5 sec.)

Number 34. (show slide)

In this picture a window pane is broken. What could the boy do to stop the cold air from coming in?

A. Put cardboard over the window.

B. Pull the curtains shut.

C. Build a fire in the fireplace.

(PAUSE 5 sec.)

Number 35 (show slide)

These boys are out camping and want to build a campfire. What could they do to keep it from spreading?

A. Pile dirt around the fire.

B. Keep a bucket of water nearby.

C. Put rocks on the fire.

(PAUSE 5 sec.)

Now turn to page 6.

Number 36. (show slide)

It is summertime. And this boy wants to go fishing early in the morning. What could he do to keep from sleeping too long?

A. Wait for a rooster to crow

B. Try to wake up early

C. Leave his windowshade up

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Number 37 (show slide)

This boy is trying to study, but the workmen outside are making too much noise. What would be the weirdest way for him to solve his problem?

A. Move to another room.

B. Turn on the record player.

C. Wait until the workmen stop.

(PAUSE 5 sec.)

Number 38 (show slide)

What would be the best way for these boys to get the hat?

A. Do just like they are in the picture.

B. Try to push the hat closer using the board.

C. Tell the dog to get the hat.

(PAUSE 5 sec.)

Number 39 (show slide)

This boy needs some money to buy a bicycle. What would be the best thing for him to do?

A. Try to sell his wagon.

B. Try to sell the papers to a junkman.

C. Try to get a job as a paper boy.

(PAUSE 5 sec.)

Number 40 (show slide)

This boy wants to take the bus home but he doesn't have the exact change for the bus driver. What should he do?

A. Take a taxicab.

B. Go to a store for change.

C. Call home

BEST COPY AVAILABLE

(PAUSE 5 sec.)

Now I'm going to ask you to tell me if you think there is a problem in the picture. Look at this next picture (show slide). If you think there is a problem, circle "A" for "yes". If you think there is no problem, circle "B" for "No". If you are not sure, circle "C" for "Don't know." Go ahead. This is number 41,boy hitting ball. (PAUSE 5 sec.)

Number 42. (show slide) Is there a problem here? (PAUSE 5 sec.)

Now turn to page 7.

Number 43. (show slide) Is there a problem here? (PAUSE 5 sec.)

Number 44. (show slide) Is there a problem here? (PAUSE 5 sec.)

Number 45.(show slide) Is there a problem here? (PAUSE 5 sec.)

Now turn to the next page. I would like you to think of as many ways to solve this problem as you can. Don't worry about how to spell a word. Listen to the problem as I read it and then try to think of a lot of different things you could do to solve it. You will have 6 min.

PAUSE 6 min.

Now turn to the last page. Here is the last problem. Try to think of a lot of different answers. Listen carefully while I read it. You will have 6 more minutes.

NAME_____

GRADE_____

BOY____GIRL____

1. A. The cat was lost.

   B. The mother does not want the cat.

   C. The cat ran away.

---

2. A. The boy broke the dog's rope.

   B. The boy thinks his dog has run away.

   C. The dog might knock over the garbage can.

---

3. A. The girl is wondering how to play the game.

   B. The girl wonders what she should do next.

   C. The girl wonders if she is missing a playing piece.

---

4. A. It is cold in the room.

   B. It is cold outside.

   C. The boy is frightened.

---

5. A. The boy is writing a story about baseball.

   B. He has to do his homework.

   C. He doesn't see his friends.

---

6. A. Yes

   B. No

   C. Don't know

---

7. A. Yes

   B. No

   C. Don't know

8. A. Yes

B. No

C. Don't know

9. A. Who put the bench where it is?

B. Why is the woman scolding the boys?

C. Whose books are on the floor?

10. A. Were the 3 boys mean to the small boy?

B. Who put the books on the floor?

C. What did the small boy do?

11. A. Are the 3 boys friends?

B. Why is the other boy standing there?

C. Why did the two boys begin to fight?

12. A. Did the dog run away?

B. Where has the dog been?

C. Where are they going?

13. A. The black car slid on the ice.

B. The white car was going too fast.

C. The sun blinded the driver of the black car.

14. A. Someone bumped the boy.

B. The scoop slipped off the cone.

C. The ice cream was melting.

15. A. The hammer was too old.

B. The wood was too hard.

C. The nail was too big.

---

16. A. How much air does the tire hold?

B. Is there an air pump nearby?

C. Does the tire need patching?

---

17. A. Can we go to the library?

B. Did Geronimo fight Gereral Custer?

C. How long should the report be?

---

18. A. A newspaper.

B. A shoe.

C. Their hands.

---

19. A. The table.

B. The umbrella.

C. The cabinet drawers.

---

20. A. The window.

B. The lock.

C. The bird cage.

---

21. A. The bookcase.

B. The record player.

C. The doll house.

---

22. A. The mirror.
B. The lampshade.
C. A record.

23. A. A fire will start.
B. The bottle will break.
C. The water will boil over.

24. A. She will get a pink color.
B. She will probably spill it.
C. Some of the paint will dry up.

25. A. The hose will break.
B. The rock will not stay on the hose.
C. The water will stop coming out.

26. A. Buy some food for the cat.
B. Make friends with the cat.
C. Ask her mother if she may keep the cat.

27. A. Go over her work again.
B. Ask the teacher what to do.
C. Copy her answers over.

28. A. Put the change in a pocket.
B. Be sure the change is correct.
C. See if they like the toy.

29. A. Put buckets under the leaks.
B. Hold their hands out for drips.
C. Look for water on the ceiling.

30. A. The stairs might break down.
B. There may be lots of junk lying around.
C. Someone might come and chase them away.

31. A. Whether somebody is sleeping.
B. Whether the nails are big enough.
C. Whether the nails will hurt the wall.

32. A. How heavy the boxes are.
B. How weak the second shelf is.
C. Will everything fit on the shelves.

33. A. The kite is no good because it is torn.
B. The ladder is too far from the tree.
C. The ladder is not tall enough.

34. A. Put cardboard over the window.
B. Pull the curtains shut.
C. Build a fire in the fireplace.

35. A. Pile dirt around the fire.
B. Keep a bucket of water nearby.
C. Put rocks on the fire.

36. A. Wait for a rooster to crow.

B. Try to wake up early.

C. Leave his windowshade up.

---

37. A. Move to another room.

B. Turn on the record player.

C. Wait until the workmen stop.

---

38. A. Do just like they are in the picture.

B. Try to push the hat closer using the board.

C. Tell the dog to get the hat.

---

39. A. Try to sell his wagon.

B. Try to sell the papers to a junkman.

C. Try to get a job as a paper boy.

---

40. A. Take a taxicab.

B. Go to a store for change.

C. Call home.

---

41. A. Yes

B. No

C. Don't know

---

42. A. Yes

B. No

C. Don't know

---

43. A. Yes

B. No

C. Don't know

---

44. A. Yes

B. No

C. Don't know

---

45. A. Yes

B. No

C. Don't know

1.	I don't enjoy solving problems when I'm not sure of the right answer.	YES	MAYBE	NO
2.	I like to try to think of a lot of different answers to a problem.	YES	MAYBE	NO
3.	My ideas about solving problems are not as good as the ideas some other children have.	YES	MAYBE	NO
4.	I enjoy trying to solve problems like the ones we have been working on.	YES	MAYBE	NO
5.	It is easy for me to understand these problems.	YES	MAYBE	NO
6.	Other children seemed to understand some of the problems better than I did.	YES	MAYBE	NO
7.	Other children in my class know more than I do about how to go about solving problems.	YES	MAYBE	NO
8.	I would like to work on solving some more very hard problems.	YES	MAYBE	NO
9.	Other children know more about the problems we were working on than I do.	YES	MAYBE	NO
10.	I don't like to have to think of more than one good answer to a problem.	YES	MAYBE	NO
11.	I'm just not as good as others in my class at solving problems like these.	YES	MAYBE	NO
12.	I often wish I knew how other children have answered a problem.	YES	MAYBE	NO
13.	Compared to others in my class, I get a lot of good ideas about how to solve problems.	YES	MAYBE	NO
14.	Knowing how to solve these problems is not very important for someone like me.	YES	MAYBE	NO
15.	If almost everyone knew the answer to a problem except me, I would be ready to give up and have them tell me the answer.	YES	MAYBE	NO
16.	I am better at solving problems than most of my classmates.	YES	MAYBE	NO
17.	I have trouble understanding some of these problems.	YES	MAYBE	NO
18.	The answers other children gave for some of the problems were probably better than my answers.	YES	MAYBE	NO

FIGHTING ON THE PLAYGROUND

Not many schools have enough playground equipment for all the children to use during recess. As a result, sometimes children will fight with each other about using things.

List all the ways you can think of for solving this problem.

LIFE AT SCHOOL

We're sure that you know that pupils in school get restless once in awhile. Sitting at one's desk for many hours each day can get uncomfortable.

Just suppose that you could change school, so that you would be able to relax and be more comfortable, but still learn everything that you should.

Think up all the ways you can, to change school so that it would be more relaxed and comfortable.

BEST COPY AVAILABLE

Retention Test

Script

(Times indicated in parentheses; first number for 4th and 6th grades, second number for second grade.)

Hello, boys and girls. We are going to do something today we think you will find interesting.

We are going to show you some pictures like this one on the screen. (Show slide 1).

(PAUSE 5, 5 sec.)

Here's another picture. (Show slide 2) (PAUSE 5, 5 sec.)

When we show you pictures like these on the screen, we want you to watch them closely.

We are going to ask you some questions about the pictures.

When we ask you the questions, we want you to mark your answers in an answer booklet like the one on the screen (Show slide 3)

(PAUSE 5, 5 sec.)

We will now give you an answer booklet. When you get your booklet, do not open it.

Print your full name on the first line (PAUSE 2, 2 sec.) and your grade on the second line, like the boy in the next picture. (Show slide 4) (PAUSE 3, 3 sec.) If you have any trouble, raise your hand and we will help you. (SOUND FOR BREAK) (STOP TAPE RECORDER UNTIL ALL CHILDREN HAVE A BOOKLET AND HAVE FINISHED WRITING THEIR NAME AND GRADE.) (PAUSE 6, 6 sec.)

Open your booklets to page 1. (PAUSE 7, 7 sec.) Look for the top row of boxes, next to the number 1. There are two boxes next to the number. A YES box, and a NO box. (PAUSE 4, 4 sec.)

Now, here is the next picture. (Show slide 5) (PAUSE 3, 3 sec.) If you think the little girl in this picture has a problem, mark a big X in the YES box next to number 1. If you think the girl does not have a problem, mark a big X in the NO box next to the number 1.

Remember, mark YES if the girl has a problem; and mark NO if she does not have a problem.

Make your X fill the whole box. Make sure the lines are dark enough to see. (PAUSE 10, 14 sec.) This time, I'm going to tell you the correct answer. The answer is YES, there is a problem. It looks like the girl's mother doesn't want the cat in the house. Here is what your answer booklet should look like. (Show slide 6) (PAUSE 3, 5 sec.) There is an X in the YES box. It fills the whole box. Make your X's like that, too. (PAUSE 3, 5 sec.) OK. Now I want you to try some on your own. I will not tell you the answers each time. Look at the pictures on the screen and mark YES if you think there is a problem in the picture and NO if you don't think there is a problem.

Here is picture number 2. (Show slide 7) Mark YES if there is a problem, NO if there isn't. Put an X in the box you choose. (PAUSE 11, 14 sec.)

Picture number 3. (Show slide 8) Is there a problem in this picture? (PAUSE 11, 14 sec.)

Number 4. Is there a problem here? (Show slide 9) (PAUSE 11, 14 sec.

Number 5. Is there a problem here? (Show slide 10) (PAUSE 11, 14 sec.)

Number 6. Is there a problem in this picture? (Show slide 11) (PAUSE 11, 14 sec.)

Now turn to page 2 in your books. (PAUSE 6, 6 sec.)

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I'm going to show you some more pictures, but this time you have to decide exactly what the problem is. For example, look at this next picture. (Show slide 12) Study it closely. What do you think the problem is? (PAUSE 4, 4 sec.) In your answer books next to number 1 there are three boxes.

Listen carefully while I read the three choices.

Then put a big X in the box that tells what you think the problem is.

Box A says - The baseball might hit the man.

Box B says - The baseball might break a window.

Box C says - The little boy might catch the ball.

Mark an X in the box you choose. (PAUSE 10, 14 sec.)

Here is picture number 2. (Show slide 13) What is the problem here?

Listen carefully while I read the three choices. Then put an X in the box that tells what the problem is.

A. The boy's dog is lost.

B. The boy broke the dog's rope.

C. The boy thinks his dog has run away.

Mark an X in the box you choose. (PAUSE 10, 13 sec.)

Number 3. (Show slide 14) What is the problem here?

A. The boy sees something that surprises him.

B. The boy is afraid it will rain.

C. The boy is afraid his tent will fall down.

(PAUSE 10, 13 sec.)

Number 4. (Show slide 15) What is the problem here?

A. The boy is crying because his boat is too small.

B. He is crying because his boat has floated too far away.

C. He is crying because he has to go home now.

(PAUSE 9, 13 sec.)

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Now turn to page 3. (PAUSE 6, 6 sec.)

Number 5. (Show slide 16) What is the problem here?

A. The girl wants to know how to play the game.

B. The girl wants to know if she has won.

C. The girl wonders where her other playing piece is.

(PAUSE 9, 13 sec.)

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Now, we are going to do something different.

Look at this next picture. (Show slide 17)

It is hard to figure out what is going on. If we could ask some questions maybe we could find out what is happening. Which of the following questions would be best for us to ask, so we can figure out what the problem is.

Let's do number 1 as an example. (PAUSE 3, 3 sec.)

Listen carefully.

There are 3 boxes next to number 1. Each box contains a question we might ask. Look closely at the picture while I read the three questions. Then put an X in the box that is the best question to ask.

A. Why is the door so big?

B. Why is it snowing?

C. Why is the small boy trying so hard to open the door?

Mark your answer. (PAUSE 10, 13 sec.)

C is the correct answer. (PAUSE 3, 3 sec.)

C is the best question because if we could get the answer, we might be able to figure out what is going on in the picture. (PAUSE 3, 5 sec.) Now, you try some on your own. This is number 2. Here are three more questions about the same picture. Which one would be best for you to ask?

A. What can you see from the window?

B. Is the woman scolding the boys?

C. Why is there a picture on the wall? (PAUSE 9, 12 sec.)

Number 3. Here are 3 more questions. Which one would be best to ask?

A. Were the 3 boys mean to the small boy?

B. Are the books interesting?

C. Can they get a drink?

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(PAUSE 10, 13 sec.)

Now turn to page 4. (PAUSE 5, 5 sec.)

Find number 1. (PAUSE 3, 3 sec.) Here is a new picture. (Show slide 18) Study the picture closely. Many things are going on. Which one of the following questions should you ask if you want to figure out what is going on?

A. Why is the tree so small?

B. Why are the kids pulling on the tree?

C. Why is the girl wearing a striped dress?

(PAUSE 10, 13 sec.)

Now try number 2. Which one of these 3 questions should you ask?

A. Why is the house so large?

B. Why is the girl running toward the boys?

C. Is the small boy her brother?

(PAUSE 10, 13 sec.)

Number 3. Which one of these 3 questions should you ask if you want to figure out what is going on?

A. Why are the boys near the sidewalk?

B. Did the girl come out of the house?

C. Why is the dog barking at the boys? (PAUSE 10, 13 sec.)

Now turn to page 5. (PAUSE 5, 5 sec.) Find number 1. (PAUSE 3, 3 sec.) Here is a new picture. (Show slide 19) In this new picture we will ask you to try to figure out the causes of the trouble. Two cars just had a smashup.

Look closely at the picture while I read three possible causes of the accident. Then put an X in the box that tells the most likely cause of the accident.

A. The black car slid on ice.

B. The white car was going too fast.

C. The sun was too bright.

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(PAUSE 10, 13 sec.)

Number 2. Which one of these three is the best guess of the cause of the accident?

A. The sun blinded the driver of the black car.

B. The stop sign was too small to see.

C. The black car was driving too fast to stop.

(PAUSE 10, 13 sec.)

Here is a new picture. (Show slide 20) This is number 3. Study the picture closely. Imagine yourself at the corner of Main and Oak Streets. You want to get to the A & P Store. What do you need to know to get there? I will read three questions. Pick the question which would be best for you to ask to find out how to get to the A & P.

A. Should I take Oak or Main Street?

B. What is the address of the A & P Store?

C. How far is it to the A & P store?

(PAUSE 10, 13 sec.)

Now number 4. Here is another picture. (Show slide 21) These kids are on a committee. The committee must give a report about the Indian Geronimo. Which one of the following questions should they ask the teacher to be sure they know what to do?

A. Will we still get recess after the report?

B. Did Geronimo kill General Custer?

C. How long should the report be?

BEST COPY AVAILABLE

(PAUSE 9, 13 sec.)

Now turn to page 8 and find number 1. (PAUSE 5, 5 sec.) Here is a new picture. (Show slide 22) These kids have to plan a party for Halloween. Their problem is that they must have quite a bit of money, they need the teacher's permission, and the party must be held on a day when there are no other big events. They find out that they have the money, and October 29 is a good day. Do they have enough information to go ahead planning the party? By number 1 mark YES if you think they have enough information; mark NO if you think they do not have enough information; or mark DON'T KNOW if you don't know or aren't sure if they have enough information. Go ahead and mark the box you choose. (PAUSE 10, 12 sec.) Number 2. Here is the next picture. (Show slide 23) This boy wants to build a model airplane. He knows that he needs a razor blade, glue, blue and yellow paint, and a ruler. He gets a razor blade from his father, a ruler from his desk, and glue from the basement. Does he have everything he needs? Mark YES, NO, or DON'T KNOW. (PAUSE 8, 12 sec.) Number 3. Here is the next picture. (Show slide 24) These kids were out playing. There was a house nearby. They found some empty purses, an empty jewelry box, and 3 spoons. Do they have enough information to say that someone robbed the house? Mark YES, NO, or DON'T KNOW in your booklet by 3. (PAUSE 8, 12 sec.)

Now turn to page 7. (PAUSE 5, 5 sec.)

Find number 1. (PAUSE 3, 3 sec.) Here is the next picture. (Show slide 25) This boy wants to put the books on the shelf. What should he be sure to notice or think about? Pick the most important thing from these three.

A. How many books are on the shelves?

B. Who put the bookcase where it is?

C. Where will he set the books when he gets to the shelf?(PAUSE 9, 11 sec.)

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Number 2. Here are 3 more things the boy could do.

Which one is the best thing for him to do first?

A. Ask the boy who is sitting in the corner to help.

B. Put the books in the box.

C. Place the books on top of the bookshelf. (PAUSe 9, 11 sec.)

Number 3. Here are three more things the boy could do.

Which one is the best thing for him to do first?

A. Set the books on the table.

B. Push the table over by the shelf.

C. Kick the box out of the way. (PAUSE 9, 11 sec.)(SOUND, STOP FOR BREAK)

Now turn to page 8. Find number 1. (PAUSE 5, 5 sec.)

Here is a new picture. (Show slide 26)

This boy went down to the basement to play. He decided to make a play town out of some things he found there. He wanted to pretend that the town was real and that a flying saucer had landed in it. He imagined that the police ran out of the police station to see what had landed. What thing could he use for a jail cell?

A. A room in the doll house.

B. An old padlock.

C. The bird cage. (PAUSE 8, 10 sec.)

Number 2. Before the police could get to the saucer, the boy imagined it took off flying up in the sky towards the sun. What could he use for the sun?

A. The window.

B. The lamp.

C. An old record. (PAUSE 8, 10 sec.)

BEST COPY AVAILABLE

Number 3. Here is a new picture. (Show slide 27) This girl is making a doll out of old clothes and things she found. She has made the body of the doll, but needs some eyes and a hair style. Where could she get the eyes?

A. From the shirt.

B. From the tie.

C. From the shoes. (PAUSE 8, 9 sec.)

Number 4. She is using an old wig for the doll's hair, but wants to tie it back in a pigtail. What thing could she use, or use part of, to tie the hair back?

A. The shirt.

B. The shoes.

C. The pants. (PAUSE 7, 8 sec.)

Now, turn to page 9 and find number 1. (PAUSE 5, 5 sec.) Now, we are going to show you several pictures in a row. In the first picture there will be a problem. Then we will show you three more pictures. We want you to choose the picture that shows the most unusual way to solve the problem. By unusual we

mean a way that most people would not think of to solve the problem. (Show slide 28)

In this picture a ball is caught on the roof. The children want to get it down. What is the most unusual way for them to get the ball down - a way most people would not think of?

(Show slide 29)

A? (PAUSE 5, 5 sec.)

B? (Show slide 30) (PAUSE 5, 5 sec.)

C? (Show slide 31)

Mark an X on the picture you choose in your answer book.

(PAUSE 7, 10 sec.)

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Number 2. (Show slide 32) In this picture, the girl has hung some laundry out to dry, but she had used up all the space on the line and still has some clothing left over. What is the most unusual way for her to dry the left-over laundry?

A? (Show slide 33) (PAUSE 5, 5 sec.)

B? (Show slide 34) (PAUSE 5, 5 sec.)

C? (Show slide 35) (PAUSE 7, 10 sec.)

Number 3. (Show slide 36) In this picture, the children's swing has broken. They have no place to swing. What is the most unusual way for them to fix it so they can swing?

A? (Show slide 37) (PAUSE 5, 5 sec.)

B? (Show slide 38) (PAUSE 5, 5 sec.)

C? (Show slide 39) (PAUSE 7, 10 sec.)

Now, Number 4. (Show slide 40) This girl wants to hang a picture in her room. She puts a hook on the picture so that it can hang on the wall, but she has the hook very close to the edge

of the frame. What will happen when the girl hangs the picture on the wall? Look at the next 3 pictures and choose the one that shows what will happen when the girl hangs the picture on the wall.

A? (Show slide 41) (5, 5 sec.)

B? (Show slide 42) (5, 5 sec.)

C? (Show slide 43) (7, 10 sec.)

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Now turn to page 10 and find number 1. (PAUSE 5, 5 sec.) (Show slide 44)

In this next picture, a group of boys want to play football. How should they choose sides? Look at the boxes by Number 1.

A. All the big boys go on one team.

B. All the boys with glasses go on one team.

C. They should choose sides evenly.

Mark an X in the box you choose. (PAUSE 6, 8 sec.)

Number 2. (Show slide 45) This girl's room is very crowded. If you wanted some more room to store things, where would you put them?

A. Out in the hallway.

B. In boxes under the bed.

C. In somebody else's room. (PAUSE 6, 8 sec.)

Number 3. (Show slide 46) These boys have to move the dresser upstairs. How would you do it?

A. Empty out the drawers.

B. Carry it up just like it is.

C. Carry the drawers up first. (PAUSE 6, 8 sec.)

Now turn to page 11. Here is the next picture. (Show slide 47) (PAUSE 5, 5 sec.) This girl's school desk is wobbling. What could she do to make it steadier? Look at the boxes by Number 1.

A. Get a higher chair.

B. Place a piece of folded paper under one leg.

C. Press down harder with her pencil. (PAUSE 6, 8 sec.)

Number 2. (Show slide 48) In this picture a window pane is broken. What could the boy do to stop the cold air from coming in the broken window?

A. Put a piece of cardboard over the window pane.

B. Put the chair in front of the window.

C. Build a fire in the fireplace. (PAUSE 6, 8 sec.)

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Number 3. (Show slide 49) This boy and girl can't get their kite to fly. What could they do to get it to fly?

A. Cut the string.

B. Make the kite heavier.

C. Put a tail on the kite. (PAUSE 6, 8 sec.)

Turn to page 12 and look at this next picture. (Show slide 50) (PAUSE 5, 5 sec) This boy is going to change the light bulb. If he stands on the rocking chair, what might happen? Look at the boxes by Number 1.

A. The light might not work.

B. He might hit his head on the ceiling.

C. He might fall off the chair and get hurt. (PAUSE 6, 8 sec.)

Number 2. (Show slide 51) The girl in this picture is going to mix some of the red and white paint together. What will happen?

A. She will get a pink color.

B. She will spill all of it.

C. The paint will dry up. (PAUSE 6, 8 sec.)

Number 3. (Show slide 52) Look at the shelves in this picture. What might happen if you were to pile some boxes on the second shelf?

A. The cabinet might fall over.

B. The shelf might break under the load.

C. The boxes might not fit. (PAUSE 6, 8 sec.)

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Number 4. (Show slide 53) Here two girls are arguing over who is going to pay with the doll. What might happen if they keep pulling on the doll?

A. They will take turns playing with it.

B. One of the girls will win.

C. The doll may rip. (PAUSE 6, 8 sec.)

Turn to page 13 and look at this next picture. (Show slide 54) (PAUSE 5, 5 sec.) This girl is finishing a test in school. Before handing it in to the teacher, what should she do? Look at the boxes by Number 1.

A. Check her work.

B. Write a letter to a friend.

C. Copy her answers on another piece of paper. (PAUSE 6, 8 sec.)

Number 2. (Show slide 55) This boy is going to go swimming. He wants to blow up an inner tube to take with him. What should he do before blowing up the tube?

A. Empty the tub of water.

B. Go and get a towel.

C. Make sure the tube doesn't have a hole in it. (PAUSE 6, 8 sec.)

Number 3. (Show slide 56) There has been a heavy snow storm. The boy is going outside to play. What should he do before going down the stairs?

A. Watch out for ice on the stiars.

B. Slide down the rail.

C. Make a snowman on the steps. (PAUSE 6, 8 sec.)

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Number 4. (Show slide 57) These two children have paid for some cokes and a toy in the store. What should the children do before going home?

A. Stop and drink some of the coke.

B. Check to see if they got the right change.

C. Play with the toy on the way home. (PAUSE 6, 8 sec.) (SOUND FOR STOP)

NAME _____

GRADE _____

1 YES NO

2 YES NO

3 YES NO

4 YES NO

5 YES NO

6 YES NO

1

A	B	C
THE BASEBALL MIGHT HIT THE MAN.	THE BASEBALL MIGHT BREAK A WINDOW.	THE LITTLE BOY MIGHT CATCH THE BALL.

2

A	B	C
THE BOY'S DOG IS LOST.	THE BOY BROKE THE DOG'S ROPE.	THE BOY THINKS HIS DOG HAS RUN AWAY.

3

A	B	C
THE BOY SEES SOMETHING THAT FRIGHTENS HIM.	THE BOY IS AFRAID IT WILL RAIN.	THE BOY IS AFRAID HIS TENT WILL FALL DOWN.

4

A	B	C
THE BOY IS CRYING BECAUSE HIS BOAT IS TOO SMALL.	HE IS CRYING BECAUSE HIS BOAT HAS FLOATED TOO FAR AWAY.	HE IS CRYING BECAUSE HE HAS TO GO HOME NOW.

5

A	B	C
THE GIRL WANTS TO KNOW HOW TO PLAY THE GAME.	THE GIRL WANTS TO KNOW IF SHE HAS WON.	THE GIRL WONDERS WHERE HER OTHER PLAYING PIECE IS.

	A	B	C
1	WHY IS THE DOOR SO BIG?	WHY IS IT SNOWING?	WHY IS THE SMALL BOY TRYING SO HARD TO OPEN THE DOOR?
2	WHAT CAN YOU SEE FROM THE WINDOW?	IS THE WOMAN SCOLDING THE BOYS?	WHY IS THERE A PICTURE ON THE WALL?
3	WERE THE 3 BOYS MEAN TO THE SMALL BOY?	ARE THE BOOKS INTERESTING?	CAN THEY GET A DRINK?

A	B	C
WHY IS THE TREE SO SMALL?	WHY ARE THE KIDS PULLING ON THE TREE?	WHY IS THE GIRL WEARING A STRIPED DRESS?
A	B	C
WHY IS THE HOUSE SO LARGE?	WHY IS THE GIRL RUNNING TOWARD THE BOYS?	IS THE SMALL BOY HER BROTHER?
A	B	C
WHY ARE THE BOYS NEAR THE SIDEWALK?	DID THE GIRL COME OUT OF THE HOUSE?	WHY IS THE DOG BARKING AT THE BOYS?

1

A	B	C
THE BLACK CAR SLID ON ICE.	THE WHITE CAR WAS GOING TOO FAST.	THE SUN WAS TOO BRIGHT.

2

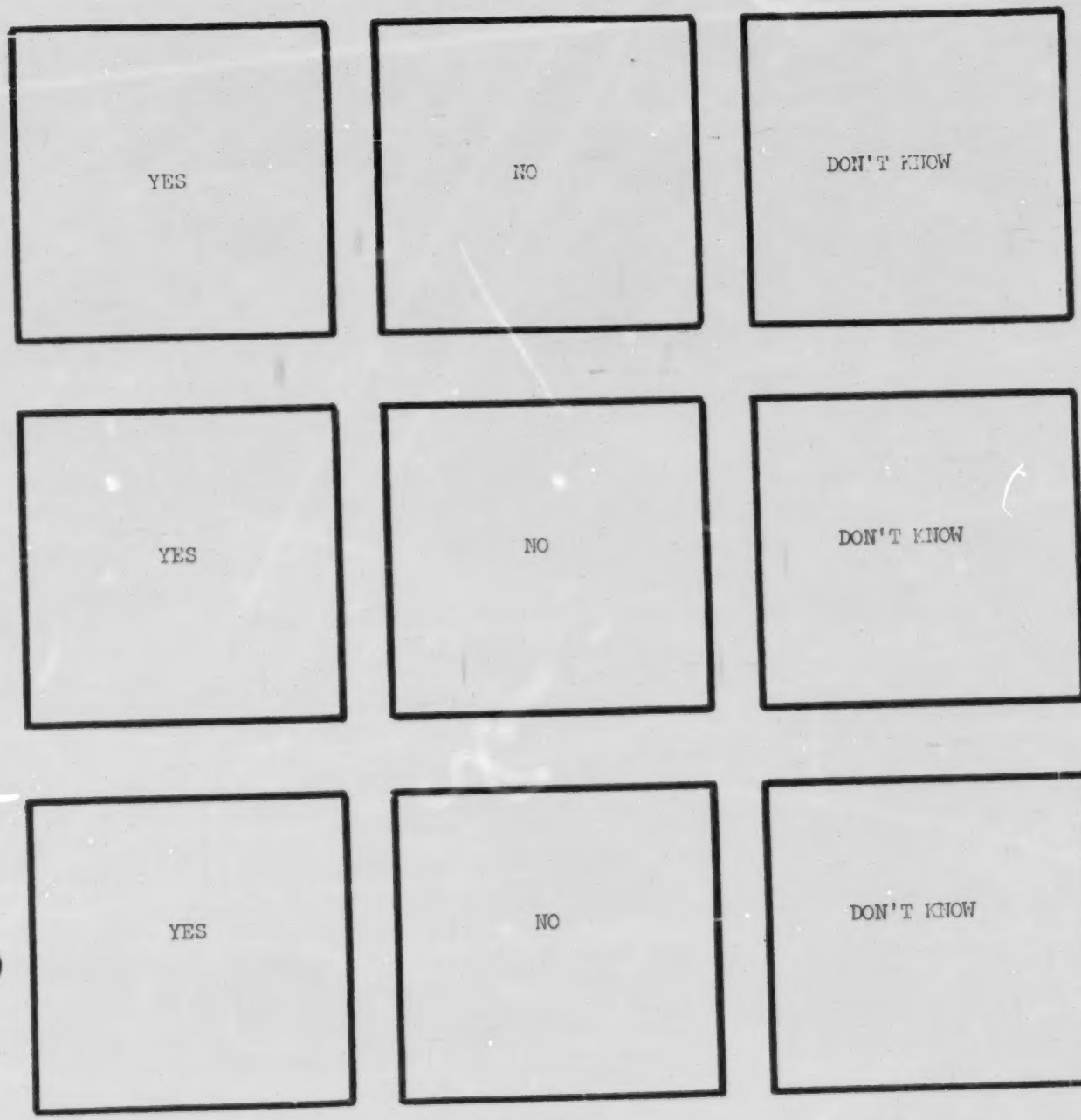
A	B	C
THE SUN BLINDED THE DRIVER OF THE BLACK CAR.	THE STOP SIGN WAS TOO SMALL TO SEE.	THE BLACK CAR WAS DRIVING TOO FAST TO STOP.

3

A	B	C
SHOULD I TAKE OAK OR MAIN STREET?	WHAT IS THE ADDRESS OF THE A & P STORE?	HOW FAR IS IT TO THE A & P STORE?

4

A	B	C
WILL WE STILL GET RECESS AFTER THE REPORT?	DID GERONIMO KILL GENERAL CUSTER?	HOW LONG SHOULD THE REPORT BE?


1
YES
NO
DON'T KNOW
2
YES
NO
DON'T KNOW
3
YES
NO
DON'T KNOW

1

A	B	C
HOW MANY BOOKS ARE ON THE SHELVES?	WHO PUT THE BOOKCASE WHERE IT IS?	WHERE WILL HE SET THE BOOKS WHEN HE GETS TO THE SHELF?

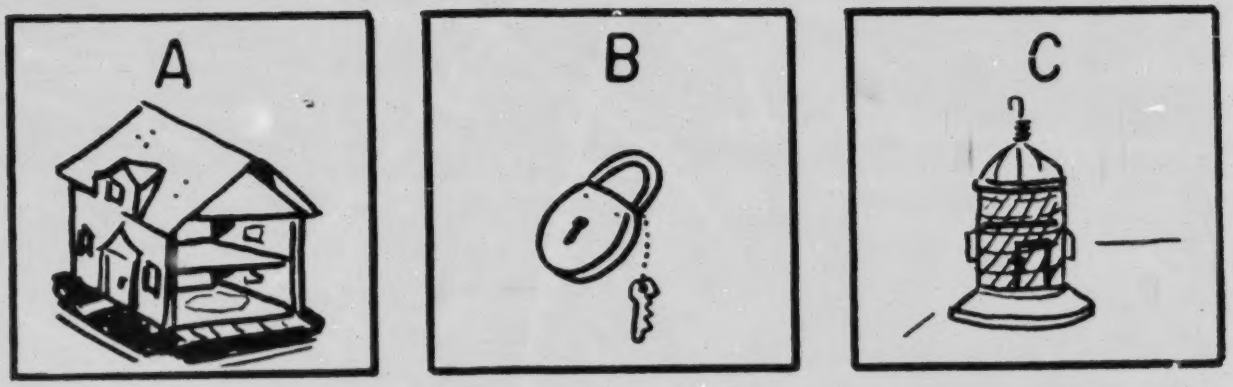
2

A	B	C
ASK THE BOY WHO IS SITTING IN THE CORNER TO HELP.	PUT THE BOOKS IN THE BOX.	PLACE THE BOOKS ON TOP OF THE BOOKSHELF.

3

A	B	C
SET THE BOOKS ON THE TABLE.	PUSH THE TABLE OVER BY THE SHELF.	KICK THE BOX OUT OF THE WAY.

1



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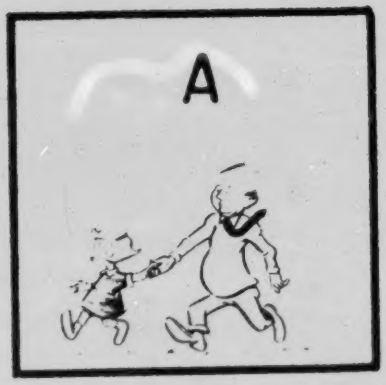
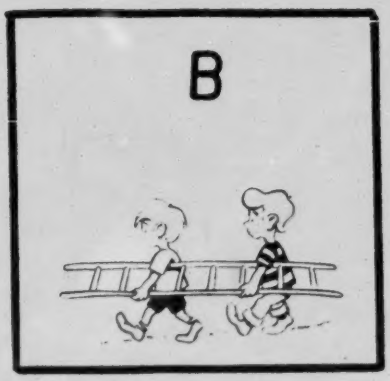
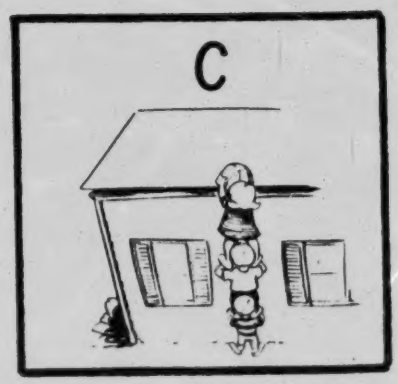
3

4

1







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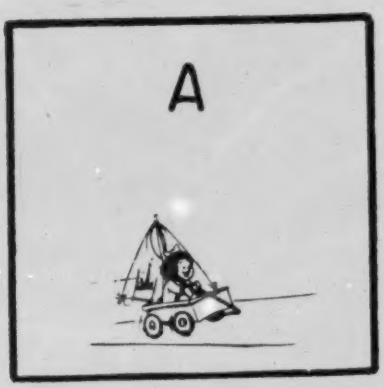

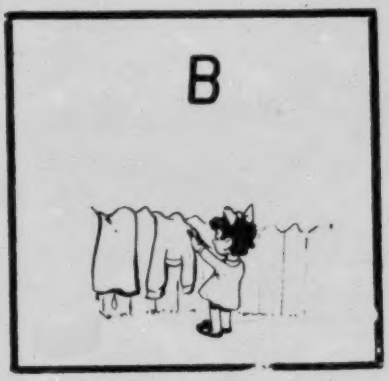

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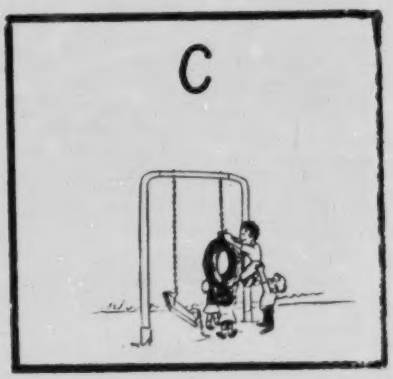

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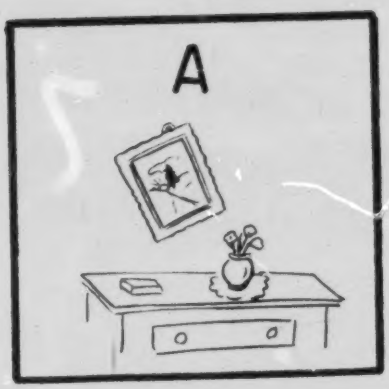

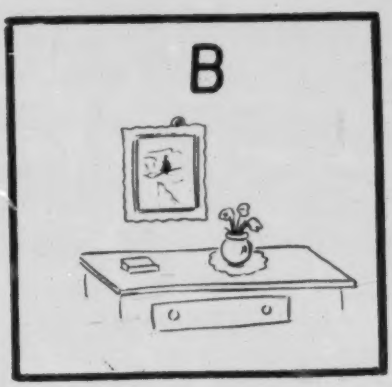

1

A	B	C
ALL THE BIG BOYS GO ON ONE TEAM.	ALL THE BOYS WITH GLASSES GO ON ONE TEAM.	THEY SHOULD CHOOSE SIDES EVENLY.

2

A	B	C
OUT IN THE HALLWAY.	IN BOXES UNDER THE BED.	IN SOMEBODY ELSE'S ROOM.

3

A	B	C
EMPTY OUT THE DRAWERS.	CARRY IT UP JUST LIKE IT IS.	CARRY THE DRAWERS UP FIRST.

1

A	B	C
GET A HIGHER CHAIR.	PLACE A PIECE OF FOLDED PAPER UNDER ONE LEG.	PRESS DOWN HARDER WITH HER PENCIL.

2

A	B	C
PUT A PIECE OF CARDBOARD OVER THE WINDOW PANE.	PUT THE CHAIR IN FRONT OF THE WINDOW.	BUILD A FIRE IN THE FIREPLACE.

3

A	B	C
CUT THE STRING.	MAKE THE KITE HEAVIER.	PUT A TAIL ON THE KITE.

1

A	B	C
THE LIGHT MIGHT NOT WORK.	HE MIGHT HIT HIS HEAD ON THE CEILING.	HE MIGHT FALL OFF THE CHAIR AND GET HURT.

2

A	B	C
SHE WILL GET A PINK COLOR.	SHE WILL SPILL ALL OF IT.	THE PAINT WILL DRY UP.

3

A	B	C
THE CABINET MIGHT FALL OVER.	THE SHELF MIGHT BREAK UNDER THE LOAD.	THE BOXES MIGHT NOT FIT.

4

A	B	C
THEY WILL TAKE TURNS PLAYING WITH IT.	ONE OF THE GIRLS WILL WIN.	THE DOLL MAY RIP.

1

A	B	C
CHECK HER WORK.	WRITE A LETTER TO A FRIEND.	COPY HER ANSWERS ON ANOTHER PIECE OF PAPER.

2

A	B	C
EMPTY THE TUB OF WATER.	GO AND GET A TOWEL.	MAKE SURE THE TUBE DOESN'T HAVE A HOLE IN IT.

3

A	B	C
WATCH OUT FOR ICE ON THE STAIRS.	SLIDE DOWN THE RAIL.	MAKE A SNOWMAN ON THE STEPS.

4

A	B	C
STOP AND DRINK SOME OF THE COKE.	CHECK TO SEE IF THEY GOT THE RIGHT CHANGE.	PLAY WITH THE TOY ON THE WAY HOME.

APPENDIX D

Teachers' Manual

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THE PURDUE ELKHART PROBLEM SOLVING PROJECT - SPRING, 1973

TEACHER'S MANUAL

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Design of the Problem Solving Materials

The problem solving materials are designed to give students practice in several skills involved in general problem solving ability. Specifically, these skills include: the ability to sense whether or not a problem exists, to define the exact nature of the problem, to ask questions to clarify the problem situation, to analyze causes, to judge whether enough information exists to solve the problem, to foresee consequences, to notice relevant and important details of problem situations, to select the most appropriate solutions, and to verify solutions.

The materials are in the form of worksheets. They present a realistic problem situation involving children and adults in a picture format. Students study the pictures and attempt to generate multiple responses to particular questions concerning the problems.

Use of the Worksheets

You should attempt to provide 15-20 minutes <u>during the day each day</u> for the students to work on one of the worksheets. You should provide one worksheet to each child to start and encourage him to think of as many ideas or different answers as he can. Only if a student has produced many (above 5 or 6), responses, all relevant to the problem or question on the worksheet, should you let him select another worksheet during that work period.

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If a student does not finish a worksheet during the period, he should place the unfinished work in his folder and return to it the next day.

During these work periods, you should feel free to adopt a class organization familiar to your class or one which will increase student work or interest. Class discussions on completed work were found to increase students' interest during the trial run at Riverview School. You might try group work on some of the worksheets or have individual students present their work to the class. Since you will have a folder for each child's work, you should encourage your students to go back and add to, or revise, earlier worksheets after you have examined and evaluated them. We found during the trial run that students liked to share ideas and look at each others' folders. This was best accomplished, however, after the students had had a chance to work individually and think of some of their own ideas.

Many students colored in the pictures on the worksheets or doodled on them. We do not mind this at all as long as they think of some ideas to answer the questions on the worksheets.

Use of Games and Rewards

As a reward for working on the materials, you should provide your students with 15-30 minutes of free time twice a week. We suggest sometime during the middle of the week and at the end of the week. During this time the students can play the games provided or engage in other activities such as reading, talking with friends, resting, or even doing additional work of any kind if they wish. However, do not force them to work on the materials during this reward period.

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We found in the trial run that students enjoyed the games and activities that they could finish or decide a winner within the time period. Also, students who did not receive a good grade on their papers became discouraged when they were not allowed free time. So we have increased the free time period to permit more involvement in the games and we want you to let every child have the free time reward regardless of how many ideas he thinks of on the worksheets. As long as a child does not disturb others or become disruptive, but at least tries to work on the materials, we want him to have some reward.

It is important, of course, that you make clear to your students that the free time is a reward for doing work on the problem materials. They must work on the materials to earn the free time. It is not a gift.

Evaluation of Student's Papers

You will have the prime responsibility for evaluating student work during the course of the project. There are two major criteria: (1) how many responses the child generates; and (2) how relevant these responses are.

You will be given a set of grading stamps:

EXCELLENT

VERY GOOD WORK

GOOD

OK, BUT TRY HARDER

You should use these stamps when evaluating student papers. A large number of responses (7 or more), all of which are relevant to the problem situation presented, should be given

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an "EXCELLENT." 5, or 6 responses, all relevant, should get a "VERY GOOD WORK". 3 or 4 relevant responses should receive a "GOOD," 1 or 2 relevant responses should be given an "OK, BUT TRY HARDER."

Copying of another child's answers should be discouraged.

You may be able to glance through and stamp each child's paper during one of the periods while the children are working on new materials. You could also walk around class during the work periods and provide instant feedback on the spot by stamping papers, but we do want you to fit your grading into a schedule that is convenient for you.

Evaluations of Student's Papers

Teachers in the trial run used their student folders when talking to parents and had favorable results. You are invited to do the same if you desire.

We do not want you to criticize a student's work because of spelling or grammar at first. It is important in the beginning to have the child think of as many ideas as possible without worrying about grammatical correctness. Later on in the project, we can shift emphasis where needed to more specific grammatical errors, after the students feel at ease working on the materials.

Purdue Observations

An observer will visit each classroom involved in the project once a week. The purposes of such visits will be threefold: 1) to bring a week's supply of problem solving

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materials in advance; 2) answer any questions that may have arisen during the week; 3) collect the student's previous weeks' work and perhaps observe a work session.

We learned during the trial run that many changes were necessary. We expect changes may come about during the major part of the project, also. We want your suggestions and questions, so feel free to express them when we visit.

In case you need to contact us during the week, our number is 317-494-8646. Ask for John Houtz, Kevin Hynes or Rita Culross. Please call collect.

Finally, let us say thank you very much for your help in the project. With your help, we are sure the materials and procedures will be quite successful.

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APPENDIX E

Worksheets Used in the Project

THIS BOY HAS BUILT A MODEL CAR, BUT ONE PIECE OF THE MODEL IS MISSING. WHAT COULD THE BOY DO TO FINISH THE MODEL?

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

_____

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_____

IF YOU THINK THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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IF THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?

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THESE BOYS ARE MOVING SOME FURNITURE. BUT THEY CANNOT FIT THIS TABLE THROUGH THE DOOR LIKE IT IS. WHAT COULD THEY DO TO GET THE TABLE INTO THE OTHER ROOM. THINK OF AS MANY THINGS THE BOYS COULD TRY AS YOU CAN.

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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WHAT ARE THREE THINGS YOU SEE IN THE PICTURE THAT MAKE YOU THINK THAT IS THE TROUBLE?

THESE TWO GIRLS WERE CLEANING OUT THE ATTIC AND FOUND AN OLD LETTER WRITTEN A LONG TIME AGO BY THEIR GREAT GRANDMOTHER. THE DATE ON THE LETTER IS 1895. DO THEY KNOW ENOUGH TO THINK THAT THE STAMP ON THE LETTER IS WORTH SOME MONEY?

WHAT ELSE DO THEY NEED TO THINK ABOUT?

WHAT COULD THEY DO TO FIND OUT IF THE STAMP IS WORTH SOMETHING?

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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WHAT DOES THIS TRUCK DRIVER NEED TO KNOW BEFORE HE DRIVES OVER THIS BRIDGE?

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_____

_____

WHAT ARE SEVERAL THINGS HE COULD DO IF THE TRUCK IS TOO HEAVY?

THE FIREMEN FOUND AN EMPTY CAN OF GASOLINE AND A BOX OF MATCHES IN A TRASH CAN NEAR THE HOUSE. DO THEY HAVE ENOUGH EVIDENCE TO SAY THAT SOMEONE SET THE BUILDING ON FIRE ON PURPOSE?

_____

WHAT ELSE COULD HAVE HAPPENED?

_____

_____

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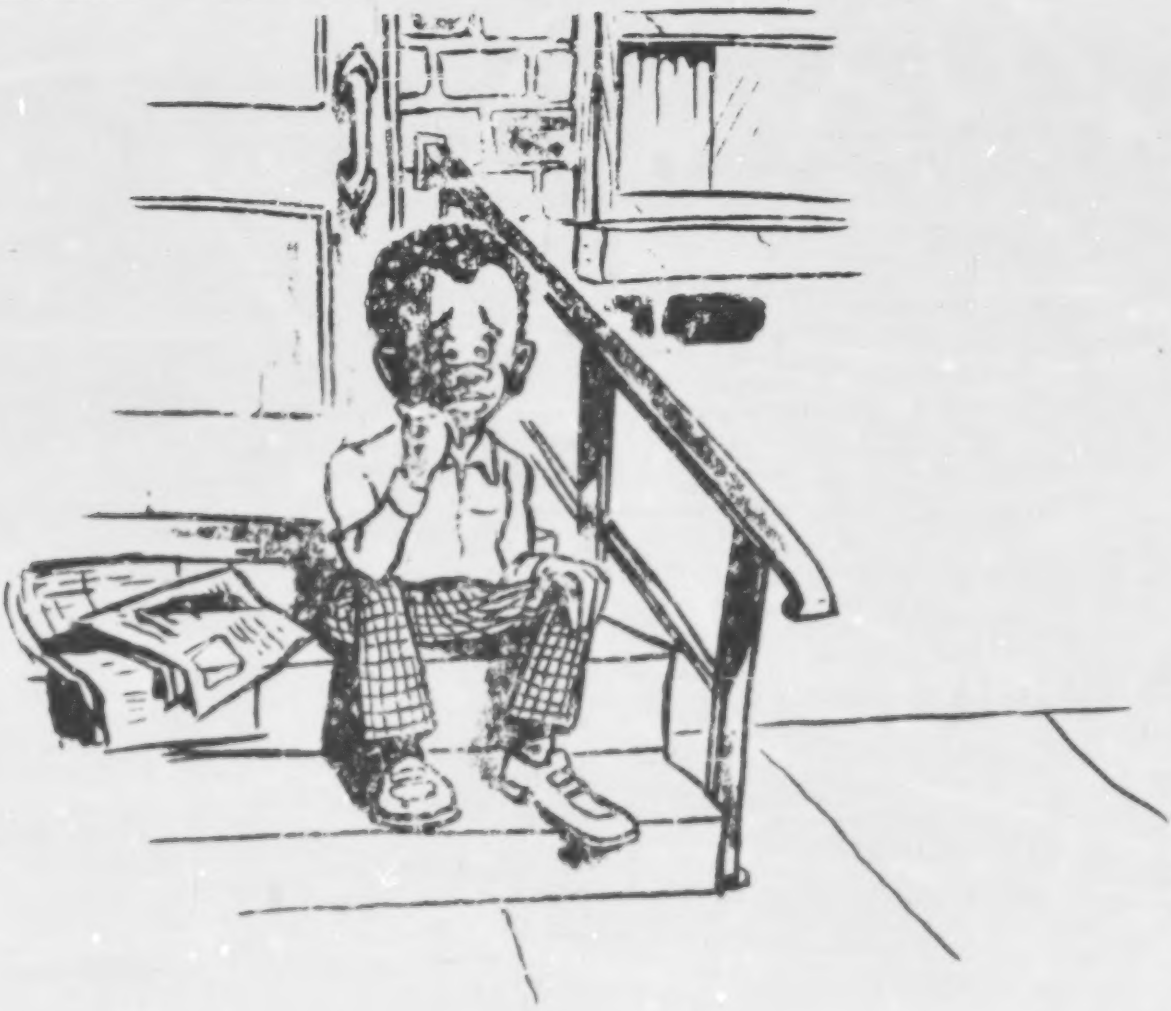
WHAT THINGS SHOULD THE FIREMEN ASK TO FIND OUT WHAT HAPPENED?

THIS FATHER AND DAUGHTER THINK MICE MADE THESE HOLES. WHAT COULD THEY DO TO SEE IF THERE REALLY ARE MICE?

WHERE ELSE SHOULD THEY LOOK TO FIND MICE, IF THERE ARE ANY?

WHAT ARE SOME WAYS THEY COULD CATCH THE MICE?

THIS GIRL IS MOVING AWAY AND HAS TO LEAVE HER CAT BEHIND. SHE WANTS TO MAKE SURE HER CAT HAS A GOOD HOME. WHAT SHOULD SHE ASK HER GIRL FRIEND TO FIND OUT HOW WELL SHE WILL TAKE CARE OF THE CAT?



THIS BOY NEEDS TO GET A JOB. HE DID NOT SEE ANYTHING IN THE NEWSPAPER. WHAT COULD HE DO TO EARN SOME MONEY?

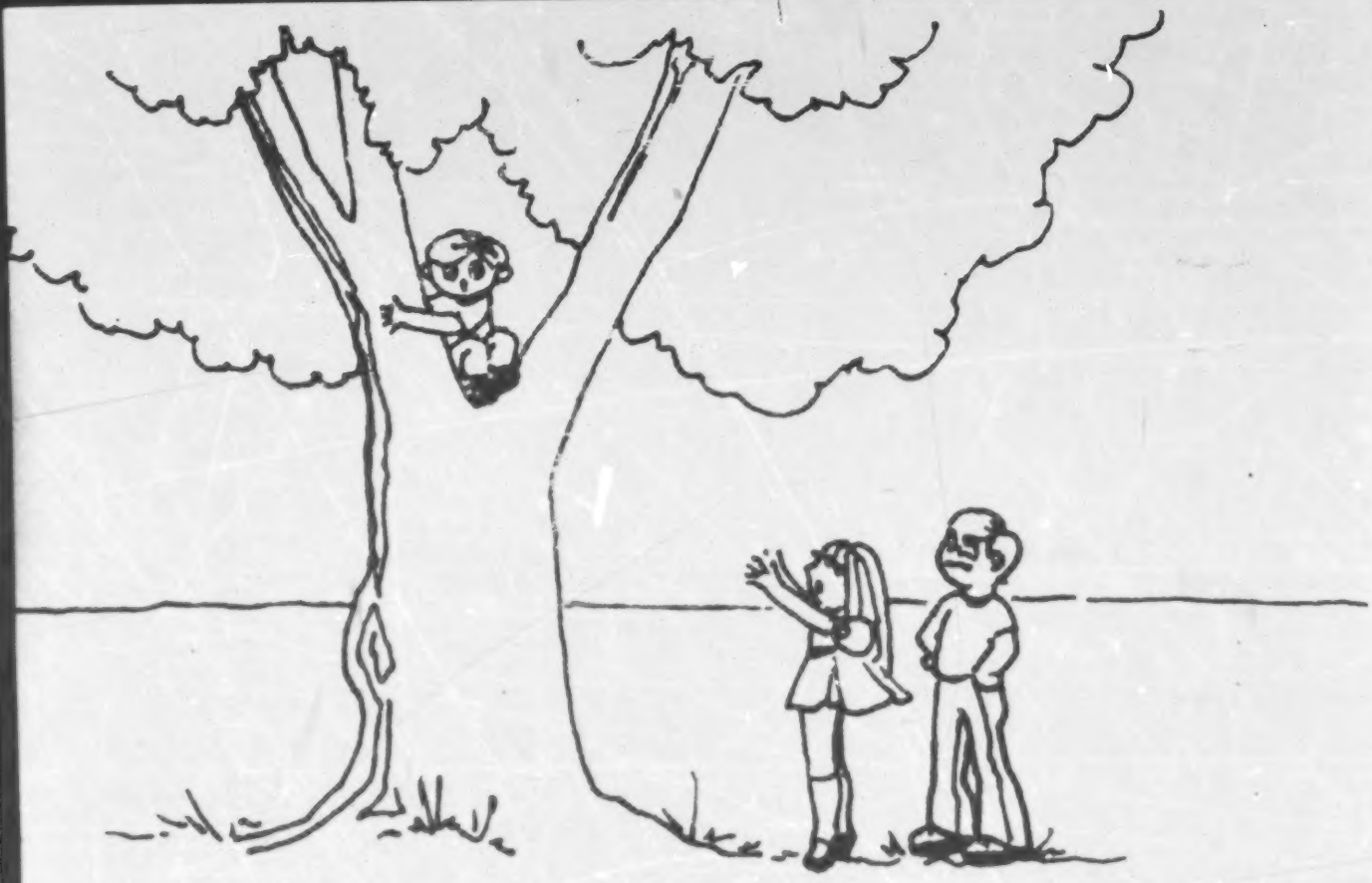
THESE BOYS HAVE FOUND A FIRE BURNING IN AN EMPTY LOT. WHAT MIGHT HAPPEN IF THEY LEAVE THE FIRE ALONE?

WHAT SHOULD THE BOYS DO?

WHAT ARE SOME OF THE REASONS WHY THE BABY MIGHT BE CRYING?

THIS FAMILY IS MOVING TO A NEW HOME. THE BOY AND GIRL ARE HELPING THEIR MOTHER PACK THE DISHES. WHAT COULD THEY DO TO KEEP THE DISHES FROM BREAKING IN THE BOXES?

WHAT COULD THE CHILDREN DO TO HELP THEIR MOTHER PACK?



A SMALL BOY HAS CLIMBED UP A TREE BUT IS AFRAID TO COME DOWN.

WHAT COULD THE OLDER BOY AND GIRL DO TO HELP HIM?

THE GIRL IN THIS PICTURE LOOKS ANGRY. WHAT COULD HAVE MADE HER SO UPSET?

THIS FATHER AND DAUGHTER THINK MICE MADE THESE HOLES. WHAT COULD THEY DO TO SEE IF THERE REALLY ARE MICE?

WHERE ELSE SHOULD THEY LOOK TO FIND MICE, IF THERE ARE ANY?

WHAT ARE SOME WAYS THEY COULD CATCH THE MICE?

A FRIEND GAVE THIS GIRL A BOX OF CARROT SEEDS AND A BOX OF DAISY SEEDS, BUT SHE FORGOT TO WRITE THE NAMES OF THE SEEDS ON THE BOXES. SHE WANTS TO PLANT THE CARROT SEEDS IN THE GARDEN AND THE DAISY SEEDS AROUND HER HOUSE. HOW CAN SHE FIND OUT WHICH SEEDS ARE IN EACH BOX?

THE CHILDREN HAVE PLAYED HERE ON SATURDAYS BEFORE, BUT THE MAN WHO COMES TO UNLOCK THE GATE IS VERY OLD. WHAT MIGHT HAVE HAPPENED TO HIM TO MAKE HIM LATE?

THE POLICEMAN TAKES THE CHILDREN TO WHERE THE OLD MAN LIVES.

WHAT DO YOU THINK THEY ARE ALL LOOKING AT?

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THE SIGN ON THE OLD MAN'S DOOR SAYS: "KNOCK LOUD, I AM HARD OF HEARING." DO THE POLICEMAN AND CHILDREN KNOW ENOUGH NOW TO SAY THAT THE OLD MAN OVERSLEPT?

WHAT ELSE COULD HAVE HAPPENED?

THEY KNOCKED VERY LOUD BUT NO ONE ANSWERED. THE DOOR WAS UNLOCKED SO THEY WENT IN. THE ALARM CLOCK HAD STOPPED AT A FEW MINUTES PAST SEVEN. WHAT DO YOU THINK COULD HAVE HAPPENED TO THE OLD MAN?

ON THE TABLE BY THE CLOCK WERE SOME BATTERIES AND A FLASHLIGHT. THE POLICEMAN SAID THAT THE BATTERIES MIGHT BE FOR A HEARING AID. IF THEY WERE DEAD, THE OLD MAN MIGHT NOT HAVE HEARD THE ALARM CLOCK GO OFF. HOW COULD THEY CHECK TO SEE IF THE BATTERIES WERE DEAD?

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THE OLD MAN CAME BACK. HE SAID HE DID OVERSLEEP BECAUSE THE BATTERIES FOR HIS HEARING AID WERE DEAD. HE WANTS TO BE SURE HE DOES NOT OVERSLEEP LIKE THAT AGAIN. WHAT COULD THE CHILDREN DO TO HELP HIM?

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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WHAT THING IN THE PICTURE MAKES YOU THINK THERE IS A PROBLEM?

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IT IS SATURDAY MORNING AND THE PLAYGROUND IS LOCKED. THESE CHILDREN ARE WONDERING WHY. WHY DO YOU THINK NO ONE HAS COME TO OPEN UP THE PLAYGROUND?

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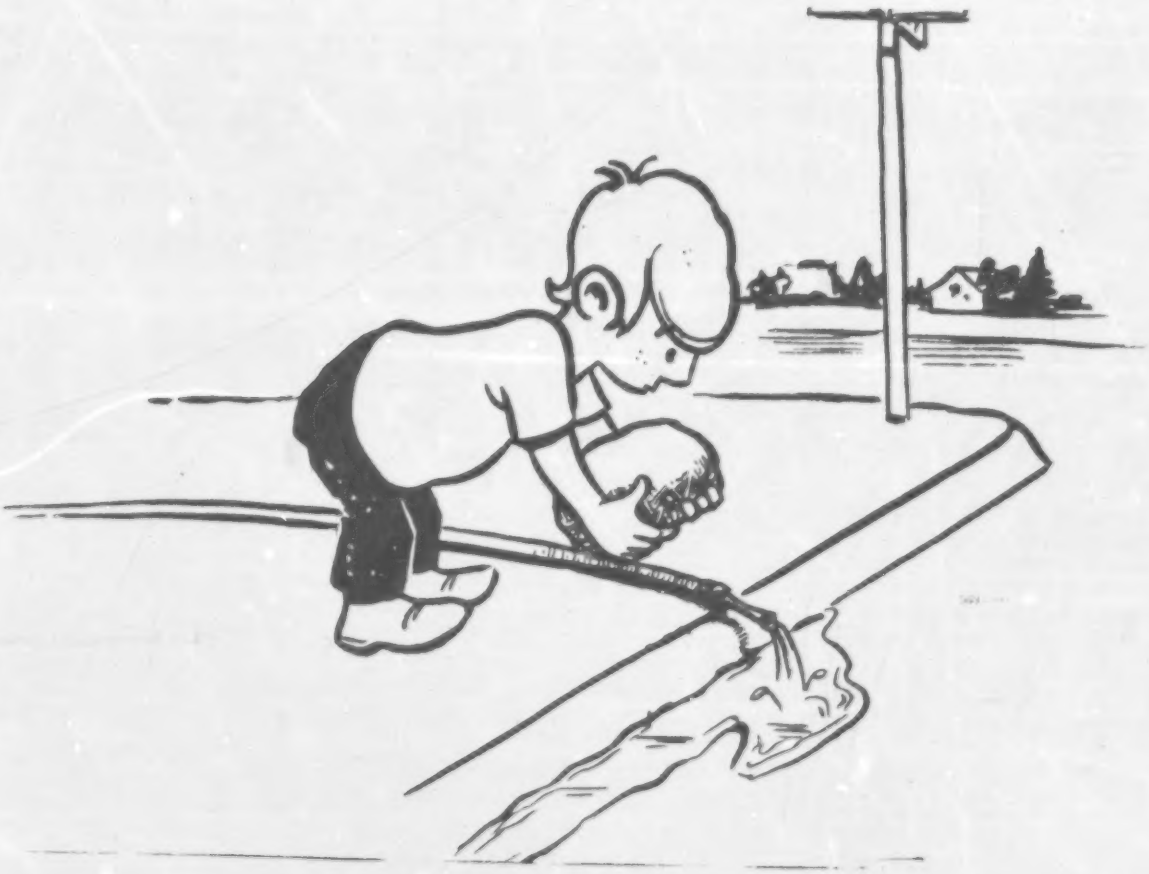
WHERE COULD THE CHILDREN PLAY INSTEAD?

_____

THESE CHILDREN MEET A POLICEMAN. MAYBE HE CAN HELP THEM. WHAT QUESTIONS SHOULD THEY ASK HIM TO SEE IF HE CAN HELP SOLVE THE PROBLEM?



IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THIS PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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IF THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?

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THESE KIDS ARE MEMBERS OF THE STUDENT GOVERNMENT AT SCHOOL. THEY WANT TO START A SCHOOL STORE. WHAT QUESTIONS SHOULD THEY ASK THE PRINCIPAL TO HELP THEM PLAN THE STORE?

WHAT QUESTIONS SHOULD THEY ASK OTHER KIDS AT SCHOOL?

THIS BOY AND GIRL ARE IN THE GARAGE LOOKING FOR SOMETHING TO PLAY WITH. THERE ARE INNER TUBES ON THE WALLS, NEWSPAPERS IN THE CORNER, A WAGON, A LAWNMOWER, A BICYCLE, SOME BOXES, A RAKE, AND A SCREEN DOOR. IF THEY WANTED TO PLAY WITH THE SCREEN DOOR, WHAT KIND OF A GAME COULD THEY MAKE UP?

WHAT KIND OF A GAME COULD THEY MAKE UP WITH THE NEWSPAPERS?

THIS BOY CAN'T REACH THE COOKIL JAR. WHAT ARE SOME OF THE THINGS HE COULD USE TO REACH THE JAR AND GET SOME COOKIES?

WHAT WOULD BE THE <u>BEST</u> WAY FOR HIM TO GET TO THE COOKIES?

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS A PROBLEM, WHAT IS IT?

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IF YOU HAD TO SOLVE THE PROBLEM, WHAT QUESTIONS WOULD YOU ASK THE TWO BOYS?

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THIS BOY IS TRYING TO STUDY, BUT THE WORKMEN OUTSIDE ARE MAKING TOO MUCH NOISE. WHAT COULD THE BOY DO TO SOLVE HIS PROBLEM?

WHAT WOULD BE THE MOST <u>UNUSUAL</u> WAY TO SOLVE THIS PROBLEM?
(A WAY THAT MOST PEOPLE WOULD NOT THINK OF)

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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IF THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?

THIS BOY'S HAT WAS THROWN OUT ON THE ICE. TO GET IT BACK, HE IS LEANING ON A LONG BOARD. WHAT MIGHT HAPPEN IF THE BOY STANDING ON THE END OF THE BOARD STEPS OFF?

WHAT WOULD <u>YOU</u> DO TO GET THE HAT BACK?

WHAT COULD THIS BOY'S DOG HAVE DONE TO MAKE THE BOY SO ANGRY?

THIS TREE IS DOWN. THE GIRL KNOWS THAT THERE WAS A STORM LAST NIGHT. DOES SHE KNOW ENOUGH TO SAY THAT THE STORM BLEW THE TREE DOWN?

WHAT OTHER THINGS WOULD THE GIRL NEED TO KNOW BEFORE SHE COULD SAY THE WIND FROM THE STORM BLEW THE TREE DOWN?

HOW COULD SHE FIND OUT FOR SURE IF THE WIND BLEW THE TREE DOWN?

THIS BOY CAN'T GET INTO HIS HOUSE. WHAT ARE ALL THE DIFFERENT THINGS HE COULD DO TO GET INTO HIS HOUSE?

WHAT WOULD BE THE MOST UNUSUAL OR DIFFERENT WAY HE COULD GET INTO HIS HOUSE?

THIS BOY AND GIRL WANTED TO GO SWIMMING, BUT THE SIGN SAYS NO. WHY DO YOU THINK THEY ARE NOT ALLOWED TO SWIM THERE?

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WHAT COULD BE DONE TO SOLVE THIS PROBLEM AND KEEP IT FROM HAPPENING AGAIN?

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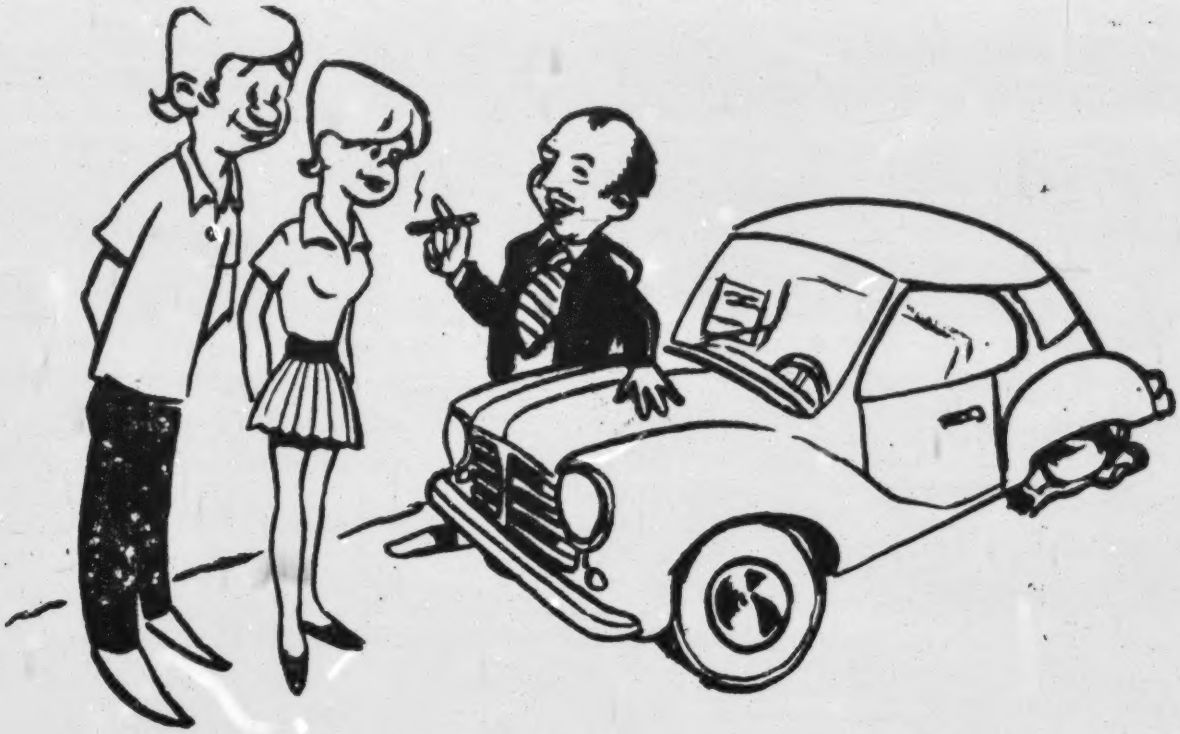

THIS YOUNG COUPLE WANT TO BUY A USED CAR. WHAT QUESTIONS SHOULD THEY ASK THE SALESMAN WHEN THEY GO SHOPPING?

WHAT SHOULD THE YOUNG COUPLE BE SURE TO NOTICE ABOUT THIS CAR?

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS A PROBLEM, WHAT IS IT?

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HOW COULD THE GIRL IN THE PICTURE SOLVE THE PROBLEM?

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THIS GIRL IS INTERVIEWING THE BUILDER OF A NEW ADDITION TO HER SCHOOL. HER STORY WILL BE PLACED IN THE SCHOOL NEWSPAPER. WHAT ARE ALL THE QUESTIONS SHE SHOULD ASK THE BUILDER SO THAT SHE CAN WRITE A GOOD STORY?

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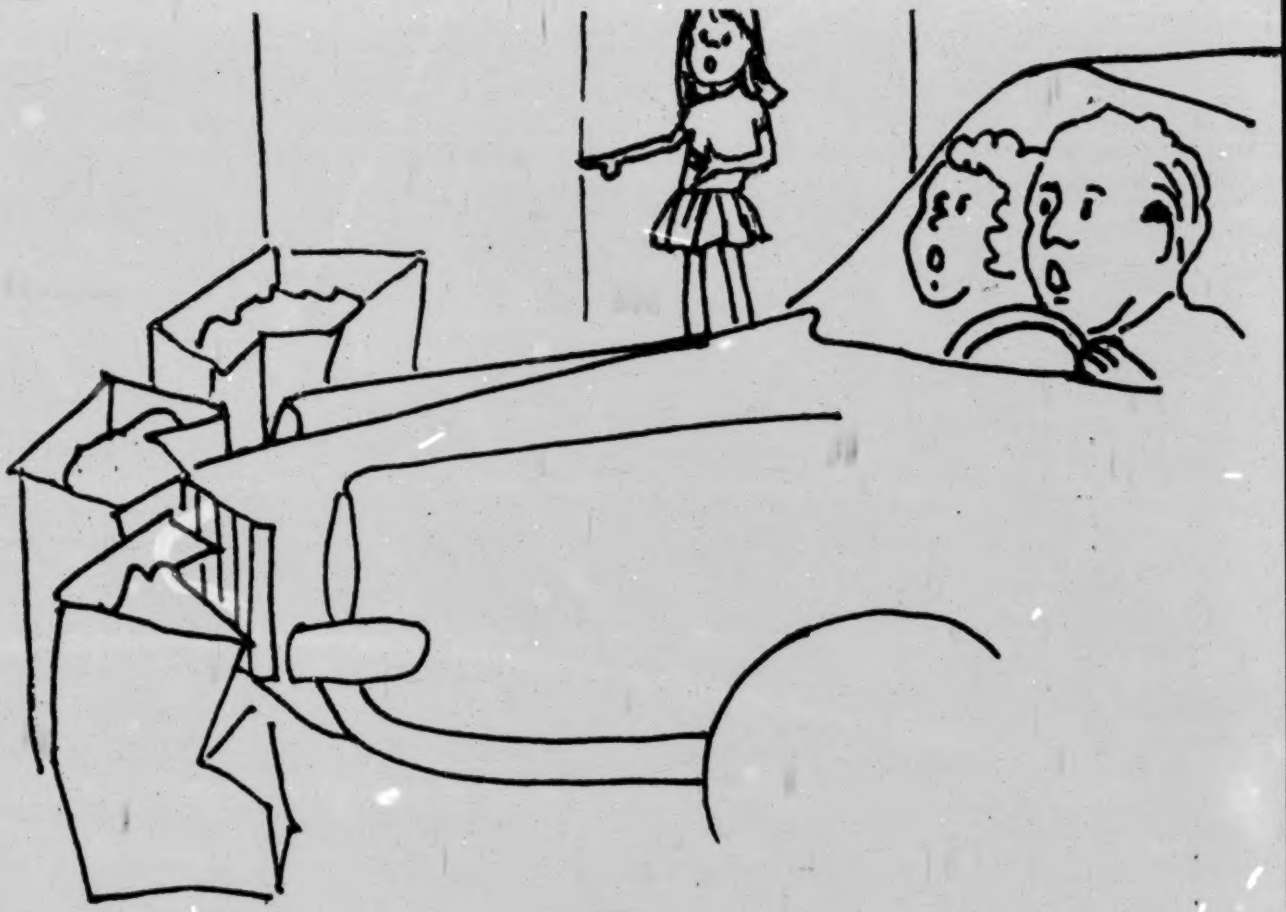
IMAGINE YOU SAW THIS MAN STANDING IN FRONT OF THE HOUSE NEXT DOOR TO YOURS. YOU DON'T KNOW HIM BUT HE IS TRYING A KEY IN THE LOCK. DO YOU THINK HE IS A ROBBER?

WHAT ELSE MIGHT HE BE DOING THERE?

THESE BOYS ARE CAMPING IN THE WOODS. WHAT THINGS SHOULD THEY KNOW ABOUT?

THEY ARE GOING TO BUILD A FIRE. HOW COULD THEY BUILD THE FIRE SO THAT IT WILL NOT SPREAD TOO FAR?



IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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HOW COULD THE PROBLEM HAVE BEEN PREVENTED?

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IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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WHAT COULD HAVE CAUSED IT?

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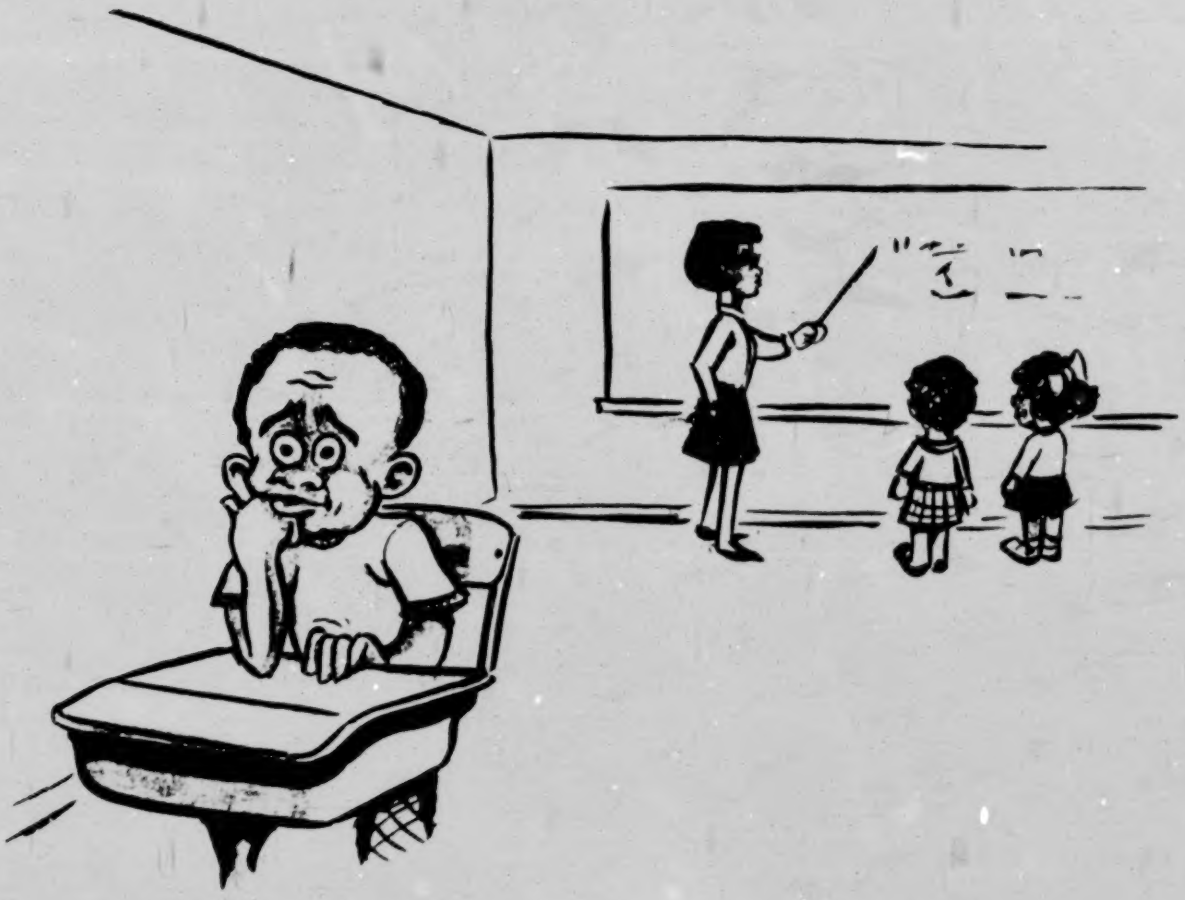
WHAT SHOULD THE GIRLS DO NOW?



THIS BOY DOES NOT LOOK VERY HAPPY. HE IS NOT DOING VERY WELL IN ARITHMETIC. WHAT DO YOU THINK HAPPENED TO MAKE HIM UNHAPPY?

WHAT ARE SOME DIFFERENT THINGS HE COULD DO THAT MIGHT MAKE HIM FEEL BETTER?

IS THERE A PROBLEM IN THIS PICTURE? _____

IF YOU THINK THERE IS, WHAT IS IT?

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WHAT MIGHT HAPPEN IF NO ONE CLEANS UP THE BASEMENT FOR A LONG TIME?

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THE OLD MAN IN THIS PICTURE IS GOING TO PAY THESE CHILDREN TO PAINT THE FENCE IN FRONT OF HIS HOUSE. WHAT QUESTIONS SHOULD THE CHILDREN ASK THE MAN SO THAT THEY KNOW EXACTLY WHAT HE WANTS THEM TO DO?

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THE FURNACE WENT OUT IN THIS BOY'S HOUSE AND IT IS GETTING COLD.

WHAT THINGS COULD THE BOY DO TO KEEP WARM?

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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IF THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?

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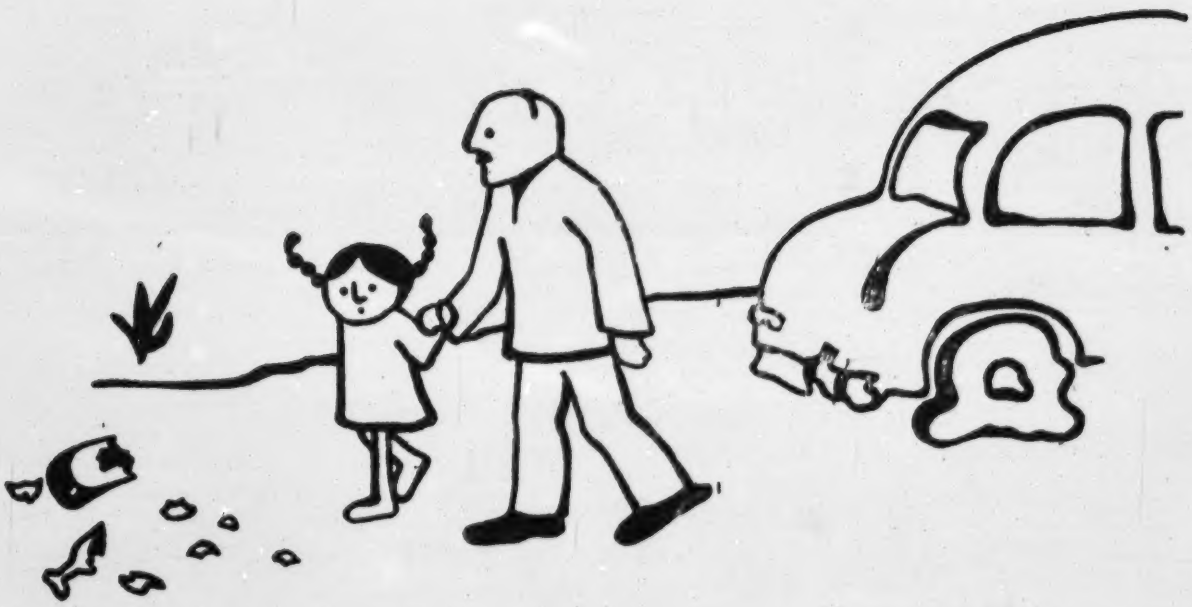
THESE TWO BOYS WRESTLING ARE TRYING TO PROVE WHO IS THE STRONGEST. HOW ELSE COULD THEY FIND OUT WHO IS THE STRONGEST? THINK OF AS MANY WAYS AS YOU CAN.



WHAT DO YOU THINK IS THE TROUBLE IN THIS PICTURE?

WHAT DO YOU THINK WAS THE CAUSE OF THE TROUBLE?

WHAT SHOULD THE MAN AND HIS DAUGHTER DO NOW?

THE APPLES IN THIS STORE JUST WENT UP IN PRICE. WHAT COULD HAVE CAUSED THAT? THINK OF AS MANY THINGS AS POSSIBLE.

IF YOU WANTED TO GROW SOME APPLES FOR YOURSELF AND YOUR FRIENDS, WHAT THINGS WOULD YOU HAVE TO FIND OUT?

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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IF THERE IS A PROBLEM, WHAT IS IT?

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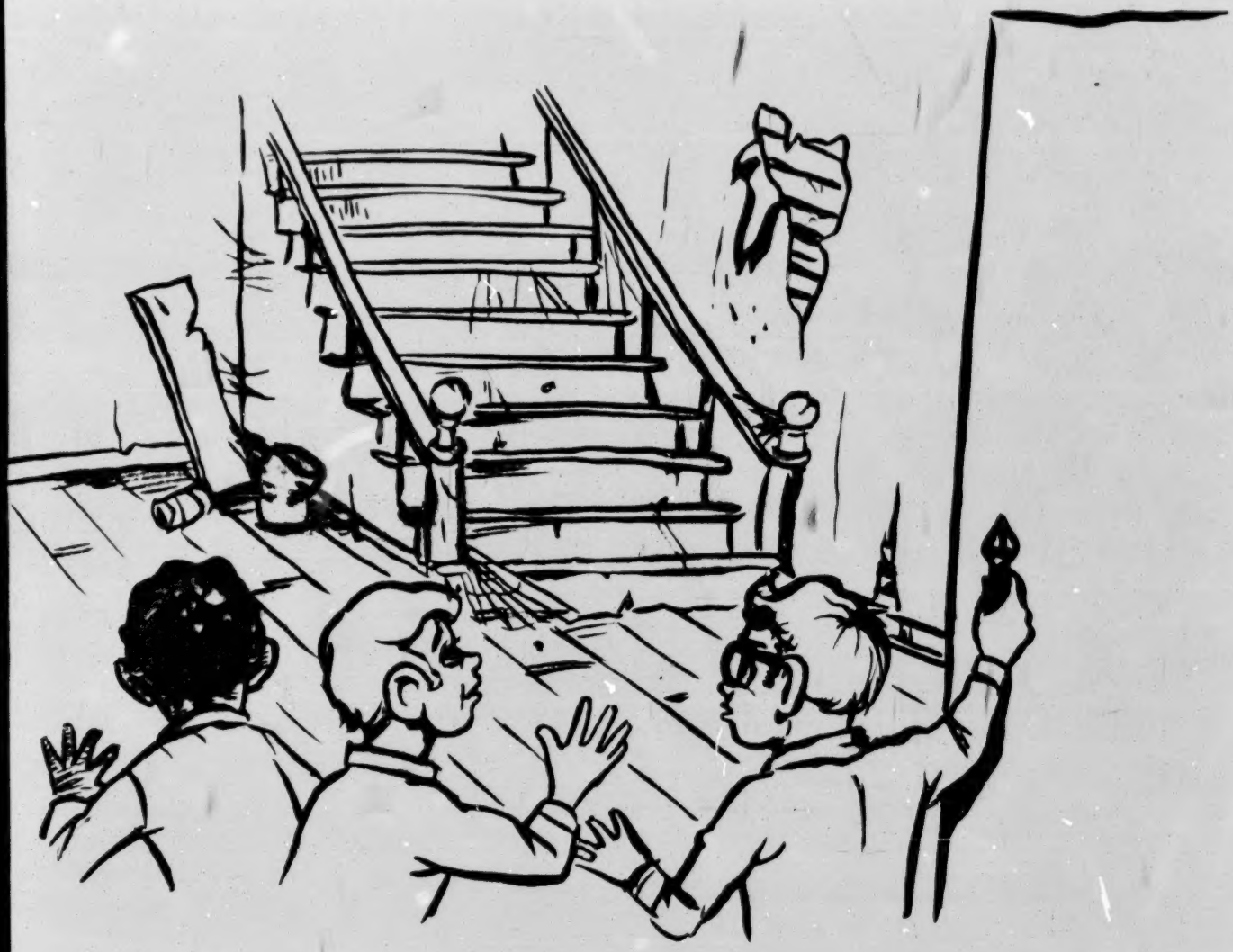
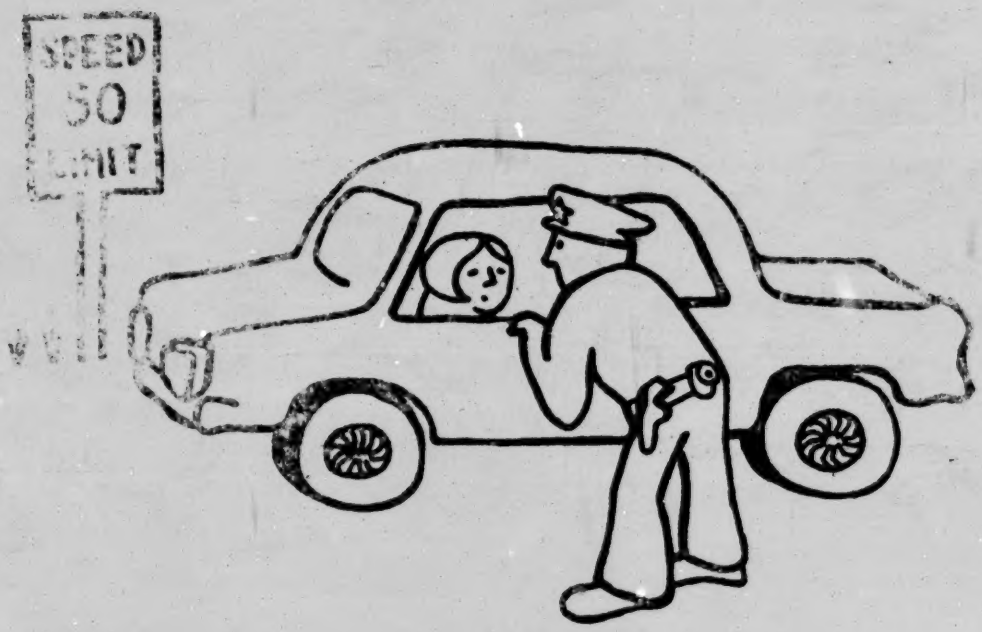
SOMEONE PUT A BOTTLE OF MILK ON THE STOVE FOR THE BABY. WHAT MIGHT HAPPEN IF THAT PERSON FORGETS THE BOTTLE? THINK OF AS MANY DIFFERENT THINGS AS YOU CAN.

THESE BOYS THINK THEY CAN MAKE MUSIC WITH THE TRASH CANS. IF THEY MAKE A LOT OF NOISE, WHAT MIGHT HAPPEN?

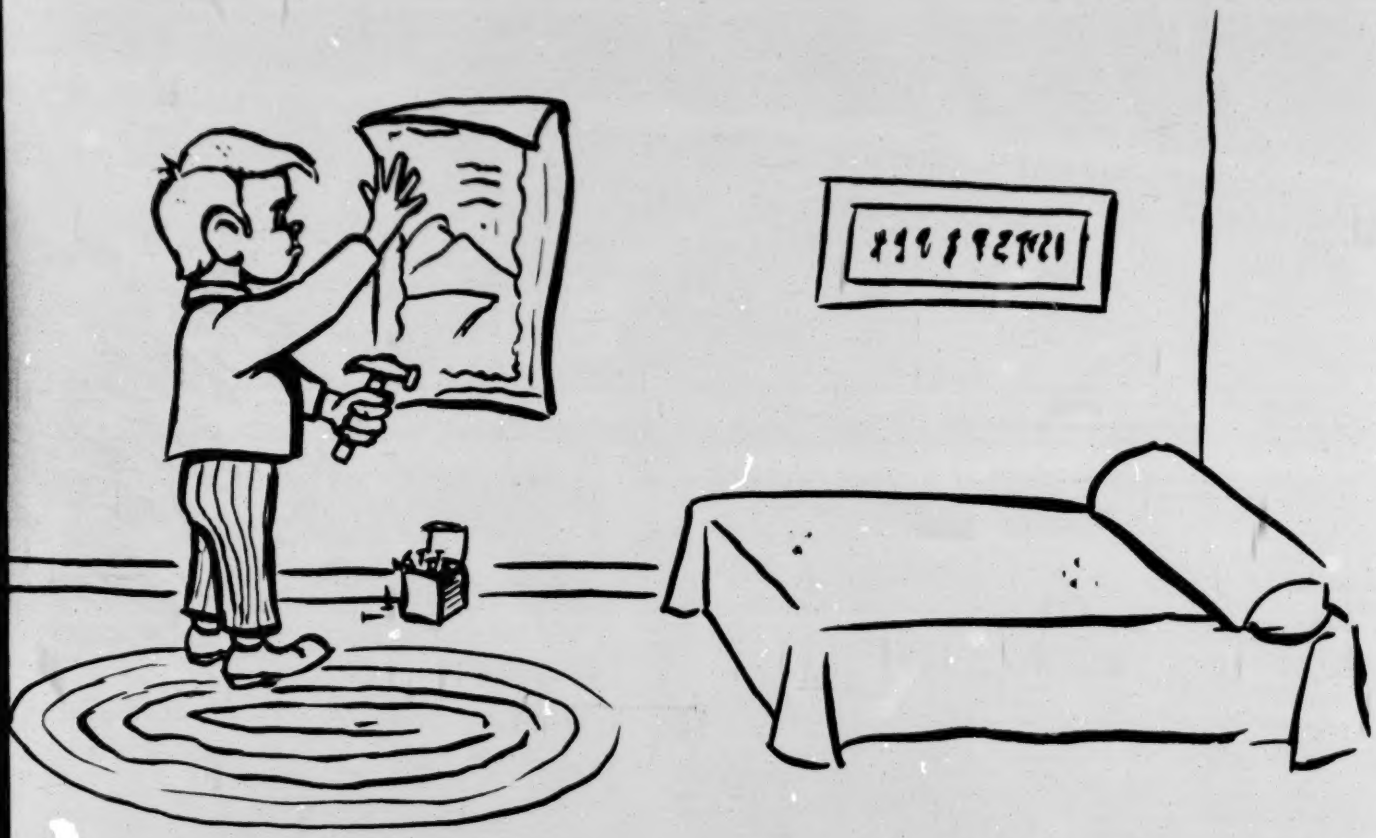


THESE BOYS ARE EXPLORING AN OLD HOUSE. EVERYTHING IS IN PRETTY BAD SHAPE. WHAT MIGHT HAPPEN IF THEY TRIED TO CLIMB THE STAIRS?

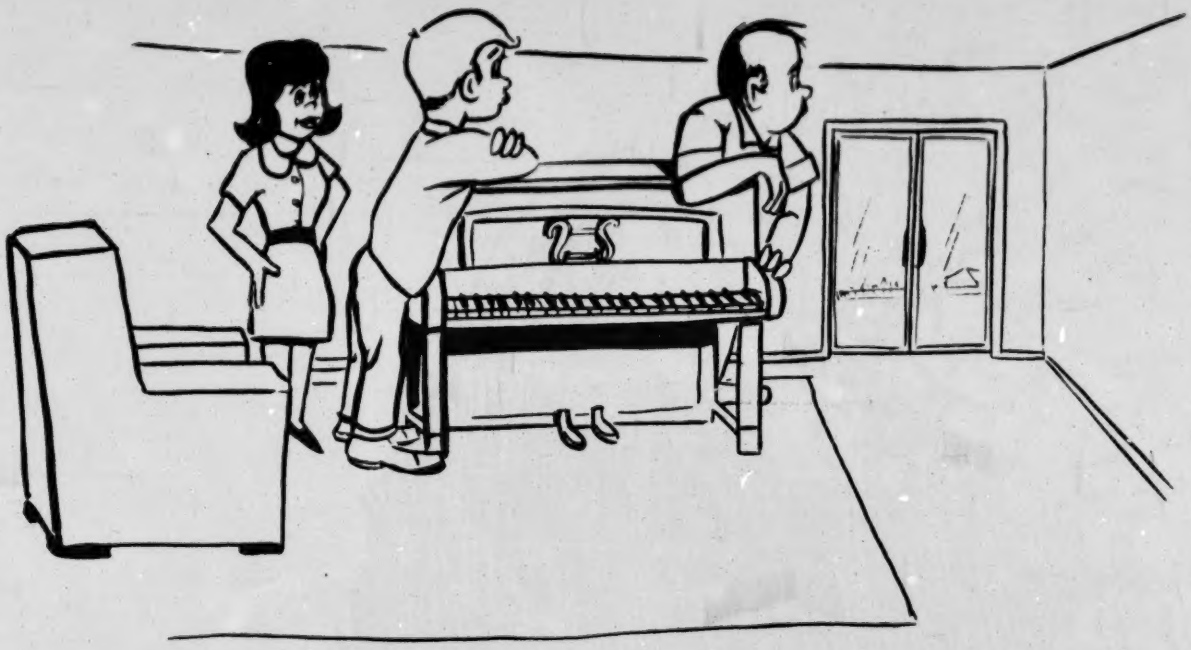


...Y DO YOU THINK THIS POLICE OFFICER STOPPED THE DRIVER IN THIS ...TORY?

COULD THAT BE THE ONLY REASON? THINK OF SOME OTHER THINGS THAT COULD BE WRONG.



THIS BOY WANTS TO NAIL A POSTER TO THE WALL. HIS MOTHER SAID IT WOULD BE OK, BUT HE HAS TO BE SURE TO GET THE NAILS INTO THE WOOD POSTS BEHIND THE WALLS. HOW CAN THE BOY FIND OUT, WITHOUT ANYONE ELSE'S HELP, WHERE THE WOOD POSTS ARE?



THIS WOMAN HAS SOLD HER PIANO AND THE MOVERS HAVE COME TO TAKE IT AWAY. SHE TELLS THE MOVERS THAT THE PIANO HAD TO BE TAKEN APART TO GET IT IN THE HOUSE A LONG TIME AGO, BUT SINCE THEN NEW PATIO DOORS WERE PUT IN. WHAT DO THE MOVERS NEED TO DO NOW.

WHAT THINGS SHOULD THE MOVERS BE CAREFUL ABOUT WHEN THEY MOVE THE PIANO?

THIS GIRL HAS JUST SEEN AN ACCIDENT. WHAT SHOULD SHE DO FIRST?

WHEN AN ACCIDENT HAPPENS, WHAT ARE SEVERAL THINGS THAT PEOPLE SHOULD DO?

WHAT QUESTIONS SHOULD THE GIRL ASK THE TWO DRIVERS TO HELP FIND OUT WHY THE ACCIDENT HAPPENNED?

THESE BOYS WANT TO BUILD A TREEHOUSE. WHAT SHOULD THEY ASK THEIR FATHERS SO THAT THEY KNOW ALL THEY NEED TO KNOW ABOUT BUILDING IT?

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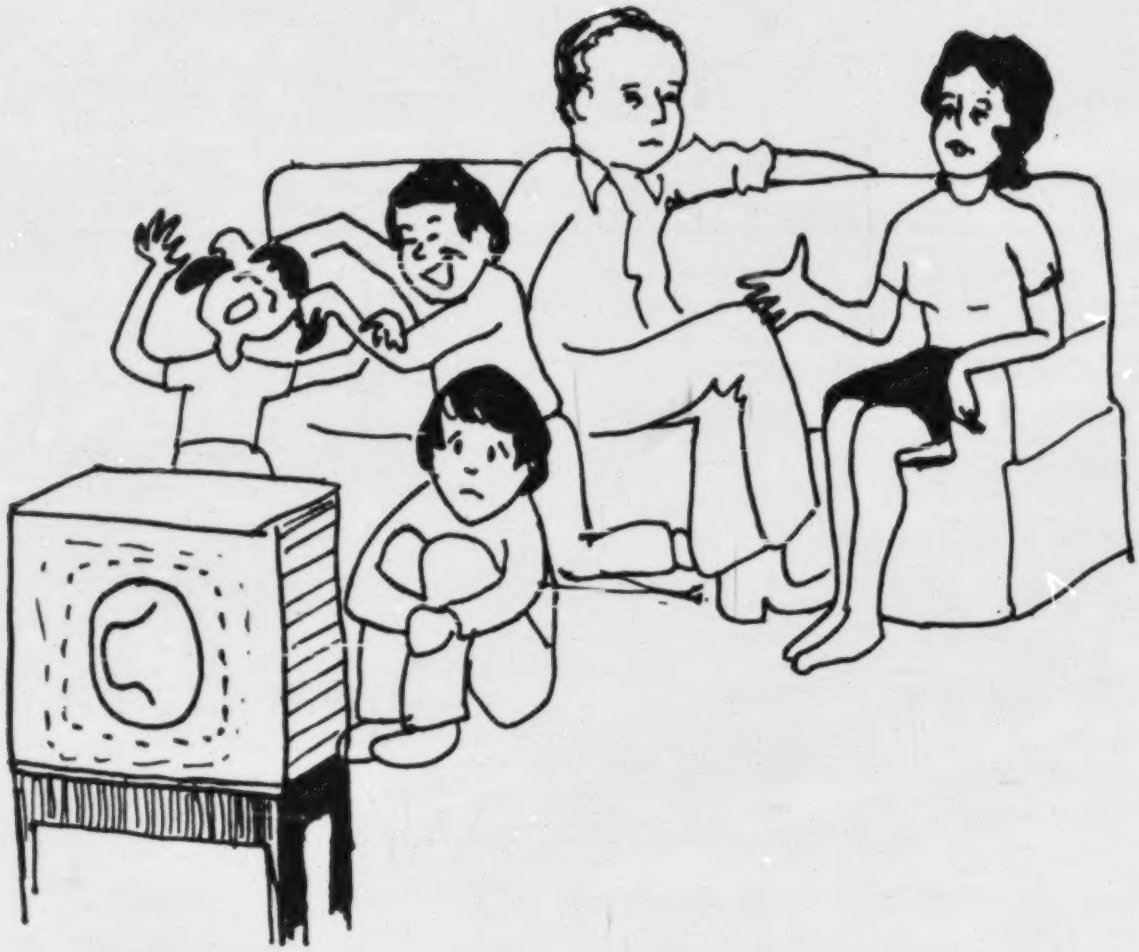
THE LAWNMOWER HAS STOPPED. WHAT DO YOU THINK THE PROBLEM IS?

WHAT MIGHT BE SOME OTHER REASONS WHY THE LAWNMOWER WOULD STOP?



THIS BOY IS TRYING TO WATCH A TV PROGRAM HE LIKES VERY MUCH. BUT EVERYONE ELSE IS TALKING AND MAKING A LOT OF NOISE. WHAT MIGHT HAPPEN IF THEY KEEP TALKING? THINK OF MANY DIFFERENT THINGS THAT COULD HAPPEN.

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_____

IS THERE A PROBLEM IN THIS PICTURE? _____

WHAT THINGS IN THE PICTURE HELPED YOU DECIDE WHETHER THERE WAS A PROBLEM OR NOT?

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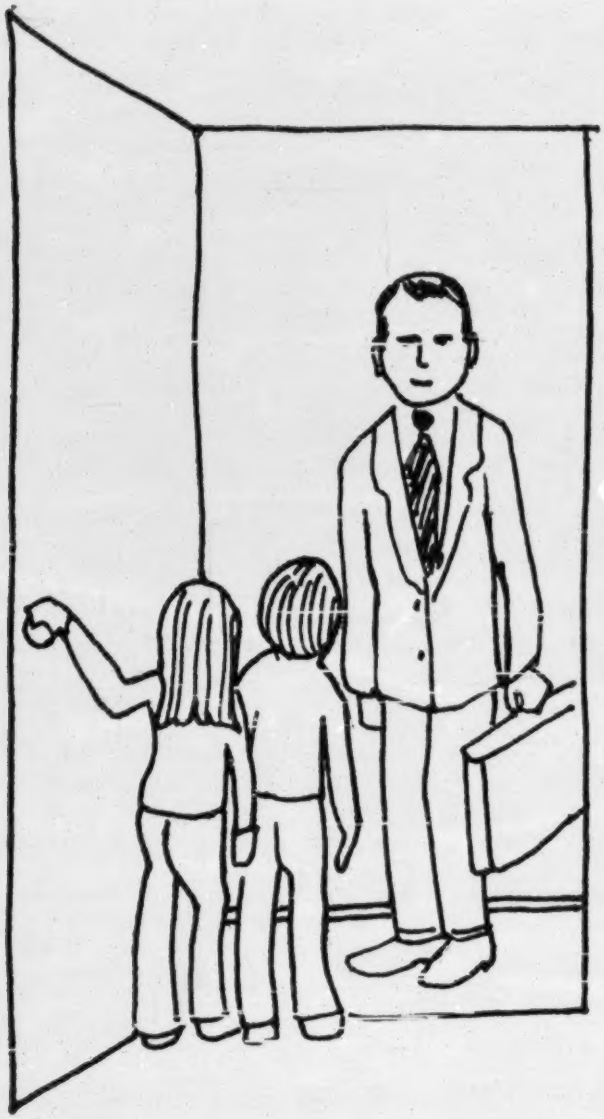
IF THERE IS A PROBLEM, JUST WHAT DO YOU THINK IT IS?



A SALESMAN HAS COME TO THE DOOR. THE MOTHER OF THESE TWO CHILDREN IS BUSY AND WILL LET THE CHILDREN TALK TO THE SALESMAN. WHAT ARE ALL THE QUESTIONS THEY SHOULD ASK THE MAN TO SEE IF THEY WANT TO BUY ANYTHING?

_____

_____

_____

THIS FAMILY'S CAR IS OVERHEATED. THERE IS A POND NEARBY. WHAT THINGS FROM THE CAR COULD THEY USE TO CARRY WATER?

_____

_____

_____

_____

_____

THIS BOY IS WAITING FOR THE BUS. BUT HE DOES NOT HAVE THE EXACT CHANGE FOR THE BUS DRIVER. WHAT CAN HE DO?

THE BIG HOUSE HAS A VERY LARGE TV ANTENNA. THAT IS VERY GOOD FOR THE TV BUT IN THE SUMMER THERE ARE A LOT OF THUNDER AND LIGHTENING STORMS. WHAT SHOULD THE PEOPLE LIVING IN THE BIG HOUSE WORRY ABOUT?

WHAT THINGS SHOULD THEY DO WHEN A STORM COMES?

IT'S ELECTION TIME FOR CLASS PRESIDENT. YOU ARE LISTENING TO THE CANDIDATES MAKE SPEECHES. AFTERWARD, THERE WILL BE TIME FOR QUESTIONS. WHAT QUESTIONS SHOULD YOU ASK THE CANDIDATES TO HELP YOU DECIDE WHO TO VOTE FOR? THINK OF AS MANY QUESTIONS AS YOU CAN.

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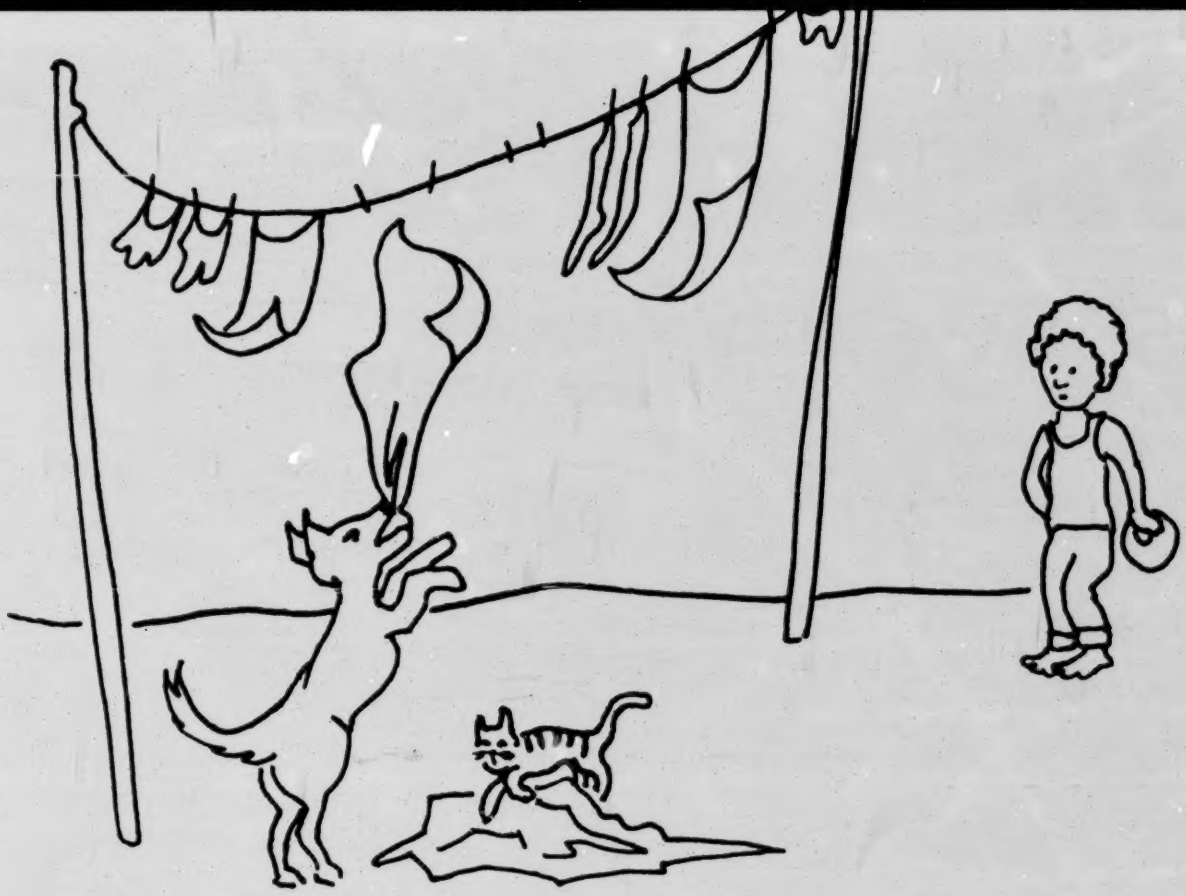
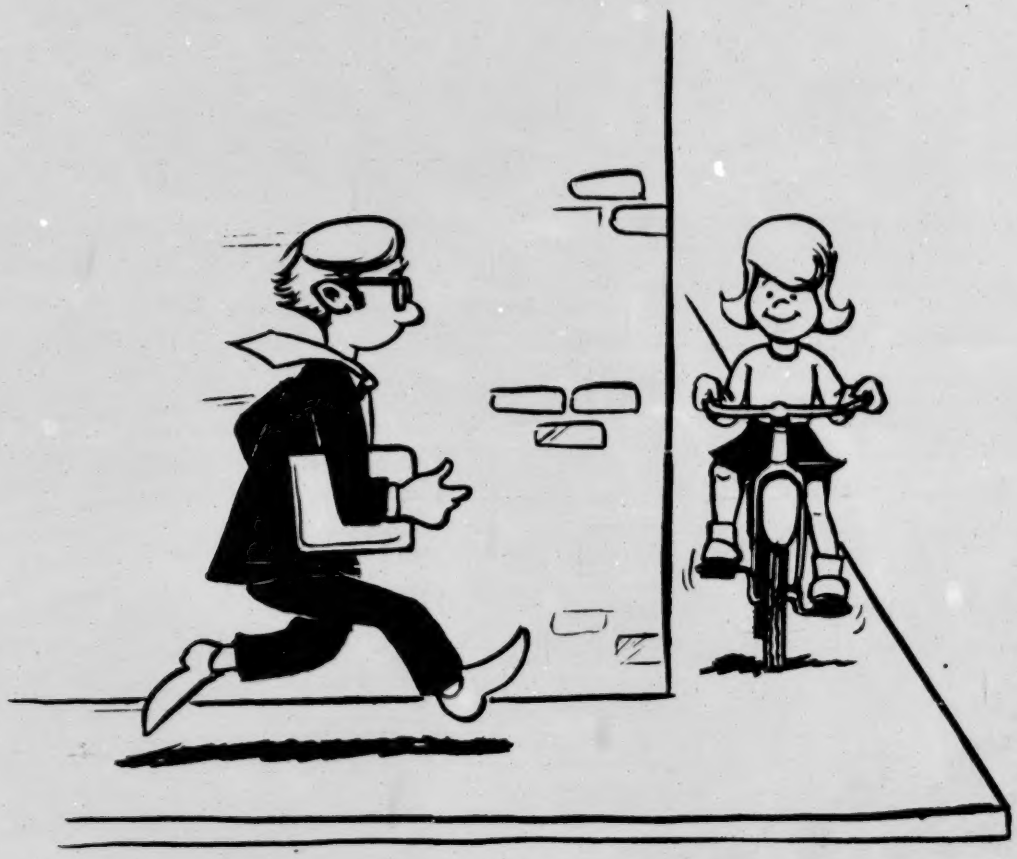


THIS DOG AND CAT HAVE PULLED SOME CLEAN WASH OFF THE LINE AND AND INTO THE DIRT. WHAT MIGHT HAPPEN IF THE BOY DOES NOT DO ANYTHING?

WHAT ARE ALL THE THINGS HE SHOULD DO?

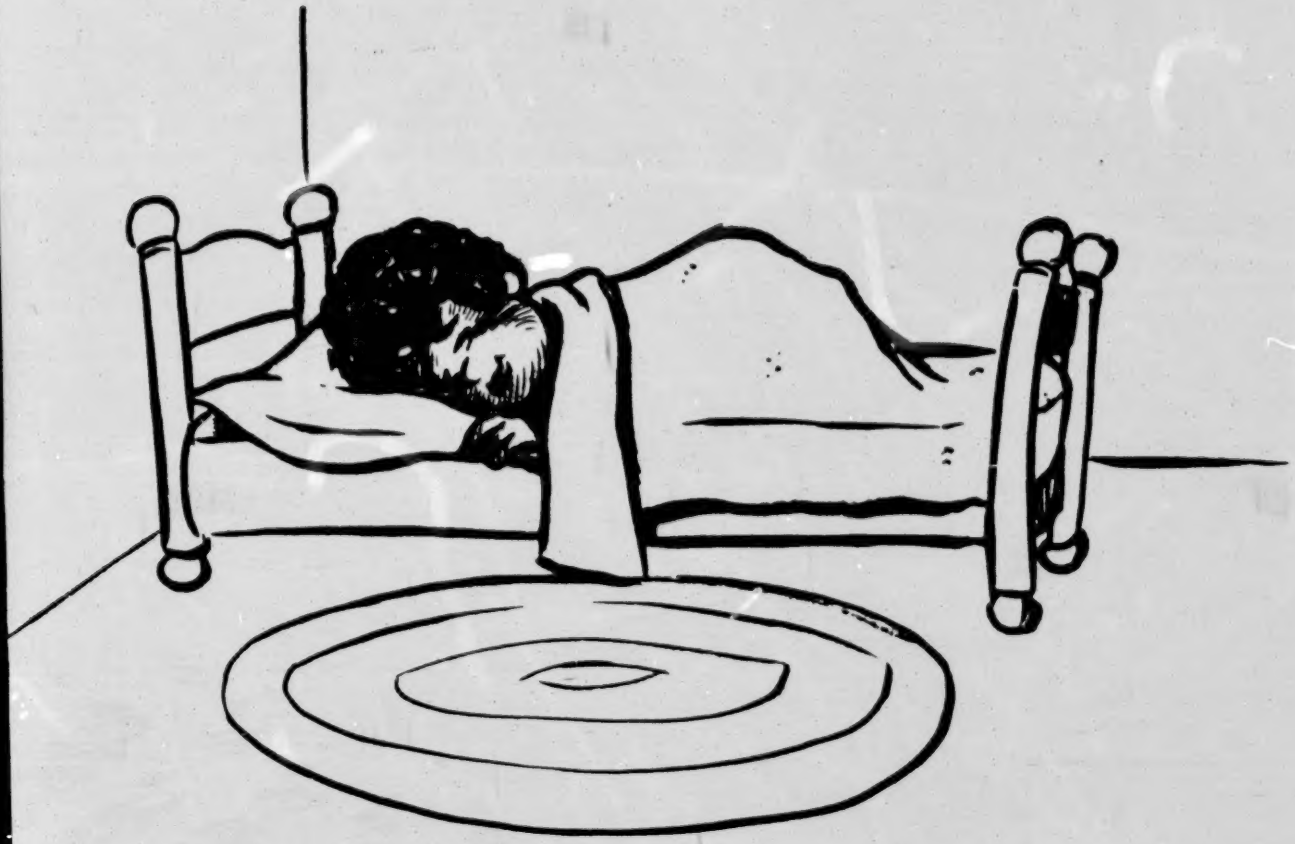
THIS BOY IS ASKING THE OWNER OF THE DRUG STORE FOR A JOB. WHAT ARE ALL THE QUESTIONS THE OWNER SHOULD ASK THE BOY?

WHAT ARE ALL THE QUESTIONS THE BOY SHOULD ASK THE OWNER TO SEE IF HE WILL LIKE THE JOB?



THIS MAN IS IN A HURRY TO MEET SOMEONE. WHAT IS GOING TO HAPPEN?

HOW COULD IT BE PREVENTED?



THIS BOY IS SOUND ASLEEP. WHAT THINGS COULD HE HAVE DONE TO MAKE HIM SO TIRED?

IF HE DOES NOT WAKE UP IN TIME FOR SCHOOL, WHAT MIGHT HAPPEN?

THE KITE IN THIS PICTURE IS CAUGHT IN THE TREE. ONE BOY IS TRYING TO GET IT DOWN. WHAT MIGHT HAPPEN?

HOW WOULD <u>YOU</u> GET IT DOWN?

THIS BOOKSHELF IS LEANING OVER. WHAT COULD BE CAUSING THAT?

WHAT COULD THE BOY DO TO STRAIGHTEN THE BOOKSHELF?

ALL OF A SUDDEN, WATER STARTED TO DRIP FROM THE CEILING WHILE THESE TWO CHILDREN WERE WATCHING TV. WHAT COULD HAVE HAPPENED?

APPENDIX F

Student Self-Evaluation Record Sheets

Name _____ Date _____

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
Excellent
Very Good
Good Work
OK, But
Try Harder